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Editorial

Axel Föller-Mancini

Auch die vorliegende Ausgabe von *RoSE: Research on Steiner Education* präsentiert wieder Artikel in den drei Rubriken *Grundlagenforschung*, *Empirie* und *Forum Anthroposophie und Wissenschaft*. Alle Beiträge zeichnet aus, dass waldorfpädagogische und anthroposophische Themen im Zusammenhang mit diversen wissenschaftlichen Positionen diskutiert werden.

Die Rubrik Grundlagenforschung eröffnet Martyn Rawson. In seinem Artikel *A complementary theory of learning in Waldorf pedagogical practice* stellt der Autor die lerntheoretischen Grundlagen der Waldorfpädagogik dar. Dies geschieht in der Absicht, die schülerbezogenen Beobachtungen der Lehrer zu professionalisieren. Lerntheorie und beobachtetes Lernen der Schüler sollen dieser These entsprechend ineinander greifen. Nachdem in Vol. IX / Nr.1 die von Axel Föller-Mancini und Bettina Berger verfasste Studie zu den Entwicklungsaspekten des Rubikon in englischer Sprache publiziert wurde, präsentieren wir in dieser Ausgabe den Text in spanischer Sprache.

In der Rubrik Beiträge zur empirischen Forschung veröffentlichen wir eine Validierungsstudie im Rahmen des IPSUM-Forschungsprojekts *Einschulungsalter und Gesundheitsentwicklung*. Dabei geht es um eine standardisierte Schuleingangsuntersuchung für deutsche Waldorfschulen. Eine solche kontinuierlich angebotene Testung könnte Prädiktoren für den Bildungserfolg und die gesundheitliche Entwicklung in der Grundschule liefern. Die Autoren kommen aus der Universitätsmedizin in Mainz und dem IPSUM in Stuttgart. Die empirische Studie von Uwe Geier fragt nach den Konsequenzen einer neuen Richtlinie der Europäischen Union. Demnach sollen zukünftig Glühlampen durch Leuchtdioden ersetzt werden. Da die Lichtqualitäten different sind, könnten sich negative Effekte auf die Lernsituationen in Schulen bzw. Klassenzimmern ergeben. Der Autor stellt ein Untersuchungsdesign und erste Ergebnisse zu diesem Forschungsbereich vor. Die dritte Studie in dieser Rubrik stellt die Ergebnisse einer quantitativ ausgerichteten Masterarbeit aus der Alanus Hochschule dar. Philipp Gelitz hat den Studiengang *Pädagogische Praxisforschung* absolviert und beschäftigte sich mit dem zunehmenden Trend zum Krippenbesuch von Kindern unter drei Jahren. Die Studie untersuchte Belastungsfaktoren und Gelingensbedingungen für den Übergang von der Krippe (Waldorfpädagogik) in den Waldorfkindergarten.

Im Forum Anthroposophie und Wissenschaft setzt sich Johannes Kiersch kritisch mit der These Heiner Ullrichs auseinander, der zu Folge die Anthroposophie im Allgemeinen und die Waldorfpädagogik im Besonderen auf vorwissenschaftlichen und teilweise mythischen Grundannahmen beruhe. Die Replik von Kiersch verweist auf die Tatsache, dass die Kulturgeschichte seit jeher von Versuchen handelt, sich der Komplexität der Wirklichkeit aus diversen Perspektiven zu nähern. Dabei verloren regelmäßig herrschende Heuristiken ihre Geltungsansprüche. Demgegenüber müsse ein Ambiguitätsprinzip aufrechterhalten werden, welches das Offenbleiben für neue Sichtweisen garantiere.

Wir wünschen allen Lesern eine anregende Lektüre!

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Editorial

Axel Föller-Mancini

The current issue of *RoSE: Research on Steiner Education* presents as usual articles in the three categories, focusing on fundamentals, empirical research and a forum for anthroposophy and science. All contributions indicate that Waldorf educational and anthroposophic topics are discussed in connection with various scientific positions.

The category *fundamentals* starts with Martyn Rawson. In his article *A complementary theory of learning in Waldorf pedagogical practice*, the author presents the theory of learning from the Waldorf pedagogy. This is done with the intention of professionalising the pupil-related observations carried out by the teachers. The theory of learning and learning through observation should work together in accordance with this thesis. After the publication of the study on the development aspects of the Rubicon written by Axel Föller-Mancini and Bettina Berger in Vol. IX / Nr.1, we present the text in Spanish in this issue.

In the empirical research section we publish a validation study within the framework of the IPSUM research project on the age of school enrolment and health development. It is about a standardized school entrance examination for German Waldorf schools. Such continuous testing could provide predictors of educational achievement and health development in primary school. The authors come from the University Medical Centre in Mainz and the IPSUM in Stuttgart. The empirical study by Uwe Geier investigates the consequences of a new policy of the European Union. Accordingly, light bulbs are going to be replaced by LEDs in the future. Since the qualities of light are different, it could have negative effects on the learning situations in schools or classrooms. The author presents a research design and first results of this research area. The third study in this category presents the results of a quantitative Master's thesis at the Alanus University. Philipp Gelitz earned his MA degree in Educational Practice Research and investigated the increasing trend towards visiting childcare places for children under three years of age (Krippe children). The study examined stress factors and conditions for the transition from Waldorfkrippe to Waldorf kindergarten.

Under the category of forum for anthroposophy and science, Johannes Kiersch critically examines the thesis of Heiner Ullrich, who based anthroposophy in general and Waldorf education in particular on prescientific and partly mythical basic assumptions. The response of Kiersch points to the fact that cultural history has always been about attempts to approach the complexity of reality from various perspectives. Thereby, prevailing heuristics regularly lose their validity claims. In contrast, an ambiguity principle must be maintained, which remains open to new perspectives.

We wish all readers an inspiring reading!

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Editorial

Axel Föller-Mancini

El número actual de RoSE: Research on Steiner Education presenta, como es habitual, artículos en tres categorías: *Fundamentos teóricos, investigación empírica y el foro de antroposofía y ciencia*. Estas contribuciones indican que los temas de pedagogía Waldorf y antroposofía se discuten en relación con diversas posiciones científicas.

La categoría de fundamentos teóricos inicia con Martyn Rawson. En su artículo *"Una teoría complementaria del aprendizaje en la práctica pedagógica Waldorf"*, el autor presenta los fundamentos de la teoría del aprendizaje de la educación Waldorf, con la intención de profesionalizar las observaciones sobre el alumnado por parte de los maestros. De acuerdo con esta posición, las teorías del aprendizaje y del aprendizaje observado de los estudiantes deben entrelazarse. Después de publicar el estudio sobre los aspectos del desarrollo del Rubicón escrito por Axel Föller-Mancini y Bettina Berger en el Vol. IX / Nr.1 (versión en inglés), presentamos en esta edición el texto en español .

En la categoría investigación empírica, publicamos un estudio de validación en el marco del proyecto de investigación IPSUM *sobre la edad de escolarización y el desarrollo de la salud*. Se trata de un examen de ingreso estandarizado para las escuelas Waldorf alemanas. Estas pruebas de forma continua podrían proporcionar factores predictivos de logros educativos y desarrollo de la salud en la escuela primaria. Los autores provienen del Centro Médico Universitario de Maguncia y del IPSUM de Stuttgart. El estudio empírico de Uwe Geier indaga sobre las consecuencias de una nueva legislación de la Unión Europea. En dicha reforma, las bombillas serán reemplazadas por luces LED. Dado que las cualidades de la luz son diferentes, éstas podrían tener efectos negativos en las actividades de aprendizaje en las escuelas o aulas. El autor presenta un diseño de investigación y los primeros resultados en esta área de estudio. La tercera investigación en esta categoría presenta los resultados de una tesis de maestría cuantitativa de la Universidad de Alanus. Philipp Gelitz completó sus estudios en investigación práctica pedagógica y abordó la creciente asistencia de los niños menores de tres años en los jardines de infancia. El estudio examinó los factores de estrés y las condiciones favorables para la transición de la guardería Waldorf al jardín de infancia Waldorf.

En el foro de antroposofía y ciencia, Johannes Kiersch examina críticamente la tesis de Heiner Ullrich, quien establece la antroposofía en general y la pedagogía Waldorf en particular en supuestos básicos pre-científicos y en parte míticos. La réplica de Kiersch apunta al hecho de que la historia cultural siempre ha tratado de abordar la complejidad de la realidad desde diversas perspectivas. Por ello, las críticas de los heurísticos actuales pierden normalmente validez. Por el contrario, se debe establecer el principio de ambigüedad que garantice la apertura de nuevas perspectivas.

¡Deseamos a todos los lectores una lectura inspiradora!

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A complementary theory of learning in Waldorf pedagogical practice

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ABSTRACT: Waldorf pedagogy requires teachers to observe and understand learning processes among their students. To do this they need a learning theory that can be used for reflection and practitioner research. The paper builds on existing theories of learning within the Waldorf discourse and outlines a complementary theory of learning formulated in a series of propositions that can be used as heuristic concepts to investigate practice. This learning theory includes Steiner's notion of a correspondence between the bodily life processes and learning processes and takes account of current phenomenological, pragmatic and social practice perspectives on learning. It is a companion paper to two previous papers on practitioner research in Waldorf pedagogy.

Keywords: Learning theory, research in Steiner education, life and learning processes

ZUSAMMENFASSUNG: Die Waldorfpädagogik verlangt, dass Lehrpersonen die Lernprozesse ihrer Schüler*innen beobachten und verstehen. Dafür brauchen sie eine Lerntheorie, die sie für die Reflexion und für die Erforschung ihrer Praxis verwenden können. Dieser Artikel schließt an bestehende Theorien zur Waldorfpädagogik an und formuliert eine Reihe von Propositionen, die als Heuristik in der Praxisforschung verwendet werden können. Diese Lerntheorie berücksichtigt auch Steiners Idee der Korrespondenz zwischen den Lebensprozessen und Lernprozessen und integriert Aspekte aktueller phänomenologischer, pragmatischer und sozialpraxis-orientierter Lerntheorien. Die Studie knüpft an zwei vorausgehende Artikel zur Praxisforschung in der Waldorfpädagogik an.

Schlüsselworter: Lerntheorie, Waldorfpädagogik, Praxisforschung, Lebens- und Lernprozesse

Introduction

Pedagogy is based on teachers' understandings of the relationship between their teaching and the learning of their students in a particular social, cultural and historical context (Nind, Curtin, & Hall, 2016). At its most basic, the pedagogical relationship involves teachers helping students to learn (Marton, 2015). Therefore, Waldorf pedagogy needs a theory of learning which practitioners can use to research, interpret and understand the context, learning processes and the learning behaviour of their students in response to the teaching and the curriculum. Understanding how their pedagogical actions influence the learning behaviour of their pupils is the most powerful way teachers can enhance, or hinder, their students' learning

(Hattie, 2012). Ideally Waldorf teachers can use a theory of learning for their practitioner reflection and research that is compatible with the philosophy and epistemology that informs Steiner pedagogy. In this paper I refer to Steiner pedagogy taught by Waldorf teachers in Waldorf schools, since the pedagogy is based on Steiner's anthropology and most school based on this approach have a recognisable practice, that can be called Waldorf, following a tradition beginning with the first Waldorf School in 1919.

A review of the available Waldorf literature shows a wealth of material on the curriculum, teaching and pedagogical anthropology but very little theoretical or empirical work on learning. Recent exceptions to this are the publications of Loebell (2000, 2016, 2017) and Schieren (2012, 2016). This lack of learning theory is not untypical of education generally. Hattie and Donoghue (2018) note that most teacher education focuses on delivering curriculum and that learning theory is conspicuous by its absence. It is not clear that Waldorf teacher education is any different in this respect, though it teaches the nature of the human being from an anthroposophical perspective, which includes the learning process. Nevertheless, my professional experience has been that in practice, understandings of learning and in particular assessment of learning are limited. Sfard (1998) has pointed out that there are two fundamental metaphors for learning- acquisition and participation. My sense is that the metaphor of participation is less well-known in Waldorf discourse.

The acquisition metaphor refers to learning as the internalisation of concepts that pre-exist in the world. Acquisition implies "gaining ownership over some kind of self-sustained entity" (Sfard, 1998, p. 5). Learning is thus an accumulation of such entities (e.g. information, concepts, facts) that can be reproduced, applied, tested and measured (e.g. in tests and exams) as evidence of learning and also transferred to other contexts or transmitted to other people. The metaphor of participation on the other hand is not a question of *having* something but of *doing*, of *taking part, sharing a part of, being a part of*, or simply *participating* in an activity that is always embedded in a social context and requires social mediation. Learning involves being increasingly able to participate in the primary activity of a specific group of people who have this practice in common. Whilst acquisition focuses on the individual mind taking something in and reifying and decontextualising it, participation, on the other hand "shifts the focus to evolving bonds between individuals and others… makes salient the dialectic nature of the learning interaction" (Sfard, 1998, p. 5).

Biesta, *et al* (2011) offer the view that people learn in different ways that can be described by several metaphors- acquisition, construction, informal learning and instruction- but that participation in social practices is the predominant mode. Within the spectrum of the metaphor of participation is the notion of learning as becoming through participation in changing practices over time (Hodkinson, Biesta and James, 2008). Illeris (2015) understands learning as the transformation of the whole person over time that cannot be accounted for by biological maturation or ageing. Indeed, a recent compilation of learning theories, *Contemporary Theories of Learning* (Illeris, 2018) offers 18 different approaches, none of which rely on acquisition alone. The metaphors we use are important because, as Sfard (2009) also points out, metaphors not only shape our thinking about learning, they also influence our pedagogical actions.

The learning theory in Steiner's pedagogical anthropology is woven into and distributed across his overall account of the developing human being. Only fairly recently have scholars drawn this body of work into a coherent theory that practitioners can use to reflect on and research practice (Loebell 2016, 2017; Schieren 2016). Loebell (2016) shows how Waldorf pedagogy relates to other learning theory, showing overlaps and differences. I believe that Waldorf learning theory can also be complemented by other learning theory. The word *complementary* in the title of this paper means *different but compatible* and *mutually useful when used together with other ideas* (Cambridge Advanced Learner's Dictionary). This is the meaning in the term complementary medicine. Thus I draw on other learning theories that I consider to be complementary in this sense, in particular I draw on the metaphor of learning through participation which underpins both phenomenological and social practice approaches.

Here I must add a brief note about what I understand by the term practice. If one follows Nicolini's (2012) discussion of the origins and meaning of practice, there is no unified practice theory but all current practice-based views, have certain aspects in common, or family resemblances. These include recognition that actions are made possible and acquire meaning through practice; practice is always situated, contingent, relational

and historical; practices are always social accomplishments and comprise a web of mutually constituting relationships and agents (or subjects) are agentic within the possibilities afforded by the practice. Thus practices are not merely reproduced because agents are always differently resourced and positioned, thus they re-create, change and may renew practice. Whilst accepting these 'family resemblances' I nevertheless believe it is helpful in a Waldorf context to take an Aristotelian perspective on praxis and its virtue *phronesis*, practical wisdom (see Rawson, 2019). Seen thus, *praxis* is meaningful and meaning-making human activity that reflects the nature of being human. Unlike *poiesis*, which means making or doing something to achieve a specific end, praxis is an end in itself and is thus close to the notion of *Bildung* or *Selbstbildung* (self-formation) (Thompson, 2009).

My aim is to formulate a series of propositions about learning that teachers can use with illuminative practitioner research (see Rawson, 2018a). Theory, in this sense, means an account of how learning occurs that can be used as a heuristic tool to observe and interpret learning processes. This paper draws on a wide range of literature about learning that cannot be discussed in a paper of this length. A fuller discussion is in preparation in book form. I start the paper by summarising existing Waldorf theory. This is followed by a discussion of two aspects of learning that relate to Steiner's theory of knowledge. Then I discuss a correlation between the life-processes and the processes involved in learning based on Steiner's work and that of subsequent authors, on the correspondence between what Steiner calls the life processes and possible learning processes. Into this interpretation I weave aspects of social practice theory and phenomenological approaches. The rest of the paper presents eight heuristic propositions about learning. Each proposition is followed by a brief explanation and suggestions as to the pedagogical research questions that arise from these.

Waldorf learning theory

Following Schieren's (2012) account of learning from a Waldorf perspective, learning involves:

1. *Transformation*. Learning means a crisis-provoked stepping out of the existing pattern of mental representations we have of the world and actively uniting oneself with reality. Learning enables the subject to restore the integration of self and world in a new equilibrium in Piaget's sense.
2. *Forgetting*. In order to learn one has to forget, which means loosening the close connections of the I to our mental representations of the world and being open to relationships between things, processes and being. This leads to adjustments in our embodied experience. Sleep is therefore a part of the learning process.
3. *Abilities*: The main benefit of learning for the subject is the growth of abilities and dispositions, rather than only the acquisition and accumulation of factual knowledge.
4. *Comprehensiveness*. Learning occurs through the fullest possible engagement with reality through direct experience wherever possible.
5. *Truth*: Learning as a process of generating knowledge unites the human being with the world's laws and this process makes the human being capable.
6. *Meaning*: Engaging the world through such abilities is experienced as relevant and meaningful.

Loebell (2017) refers to learning as the process of becoming a more experienced subject and that the learning process is mediated and enhanced by teaching. He draws attention to several key aspects of learning.

1. Learning is an expression of the activity of the subject forming her individuality, which is emergent and open (i.e. rather than fixed and predetermined). Learning is ultimately an individual process of becoming more experienced (*Erfahrenerwerden*). Becoming a subject through learning by experience occurs in different ways in thinking, feeling and willing, since thinking and willing are polarities in terms of consciousness. The Waldorf approach is to educate both thinking and willing indirectly via the feelings, though how this is done, varies fundamentally between early childhood, childhood and after puberty and also requires teachers to be artistic in their whole approach. Pedagogy as an

art involves structuring and fine-tuning the rhythms of learning in ways that respond to the specific situation.

2. Rhythm is vital for learning and this has many aspects, but most centrally a sequence of learning processes. The steps of learning have been summarised as follows:
   • taking in, directly experiencing, encountering, observing, experimenting,
   • recalling, describing, characterising, recording,
   • processing, analysing, abstracting, generalising, deepening, grasping of connections, relationships and laws, constructing concepts (Richter, 2016).
3. Bodily experience leads to embodied cognition and this highlights the central importance of sensory experience, concrete encounters with the world and activities involving movement and physical skills.
4. The significance of the teacher for learning is not only as a shaper and observer of learning processes but also as active meaning-making actor. The teacher is called upon to be both reliable as a role model and capable of transforming herself, to know and understand the pupils and to awaken a sense of trust in the pupils.
5. Loebell emphasises Steiner's point that learning is an ongoing, life-long process.
6. The content of the curriculum and what is taught undergoes a metamorphosis at key moments in the trajectory of the learners. Such key moments of change are around the age of 6/7 and the second dentition, the age of 9/10 and the onset of puberty start of adolescence. The Waldorf approach to teaching and the material that is taught changes at these stages to interact with the development of the pupils.

Wiehl (2015) characterises learning as an extensive process of assimilating the world, self-formation and self-transformation. Zech (Zech, 2016) refers to learning as a path of individuation. Learning is essentially based on transforming experience and becoming transformed. My contribution is to add the social dimension to learning in school and to apply the notion of learning as participation in communities of practice over time and across social space.

Memory

In his pedagogical anthropology, Steiner (1996) assumes a fundamental interaction between the lived-in body and the activities of the mind (thinking, feeling and willing). In this he has much in common with phenomenological approaches. Furthermore, he posits an agentic self (in German *das Ich*, the 'I' or self) as spiritual core of the human being that engages with and comes to expression through the mind and body but has an independent origin and existence beyond both. This is a fairly unique position in current theory, as one can see in compilations of contemporary theories of self (Gallagher, 2011). In Steiner's analysis of the human being, the self as spiritual core of the human being is understood as agentic within the bodily processes and within the mind (what Steiner refers to as *Seele* or in English, soul). We may, I believe, interpret this agency as being bounded by several factors including physical, mental and social constraints and what Searle (1995) calls brute facts, that is, age and biological factors, life circumstances such as poverty, malnutrition, stress, conflict, accidents and other things over which the individual has no control. Individuality as the signature of the self comes to expression in how the person engages with these constraints, how she learns, establishes identities and engages with the world and how she responds to opportunities for learning and development.

In his book, *Theosophy* (2011) Steiner describes how the fruits of our sensory experiences are preserved in memory. In his account of the supersensible (i.e. beyond the sense perceptible) processes within the human being, memories are retained by the body and the living processes that shape and maintain our physical organism, what he calls the life-body. Thus experiences and our mental and physical response to them are embodied in the lived-in body. This body of life processes retains the impressions made by our perceptions and our immediate response to these, in the form of mental images, feelings and will impulses. Each time we recall these experiences, we construct new mental images or representations. When we shift the focus of our

attention elsewhere, this new reconstruction sinks back into unconsciousness, overlaying the original memory and changing how and what we subsequently remember. Neuroscience has comprehensively described this biosocial process through which memory changes and develops over time (e.g. Damasio, 2010 Markowitsch & Welzer, 2005, Schachter, 1996). In Steiner's terms, the soul both makes impressions on the life-body and also perceives them. Steiner's description of experience is remarkably detailed, considering what was known at the time and the means he had to investigate this. The sense organs are so constituted that there is a bodily basis for sensation (sentient body) and a mental function that experiences this (sentient soul) as two distinct but integrated systems producing units of primary experience.

Memory provides us with both continuity of identity and the capacity to learn from experience. Damasio (1999) speaks of autobiographical memory as constituted by "implicit memories of multiple instances of individual experiences of the past and anticipated future… which can be partly re-modelled to reflect new experiences" (1999, p. 174). Each time we revisit an embodied experience and add new experiences through new sensory perceptions and through new internal responses to memories (e.g. through the formation of concepts and expanding awareness of connections to other experiences), our relationship to the world changes or is consolidated as habit or disposition. Waldorf pedagogy makes use of this process by actively taking account of the processes of forgetting and remembering in the way learning situations are structured (a process I describe below).

The meaning of what we perceive is given to us intuitively though concepts that have their origin in the world of ideas (Steiner, 1963), because "I am a thinking being capable of grasping truth in my spirit" (Steiner, 2011, p. 69). The human spirit- the 'I'- is embedded in the world of ideas, the spiritual world in which all realities are woven into a meaningful and coherent whole. Furthermore, the spirit transforms these embodied treasures from the past (i.e. experiences imprinted into the living unity of life body and physical body in the form of memory) into abilities and "extracts from each one whatever it can use to enhance its abilities" (Steiner, 2011, p.70). It does so by taking the forces at work within the experiences and applies these to enrichen ability. The example Steiner gives is learning to read and write. The person does not need to recall the many specific experiences of learning that led to this ability, but rather the self, or 'I' as spiritual core of the person, becomes capable of this new skill. New abilities open up new realms of experience and extends what we *can* learn. Because we can read, our whole relationship to the world changes and reading opens up enormous new possibilities for the development of our thought life and also for learning. The same is true of other new abilities.

Having new abilities enables us to form new relationships to the world and to other people. New abilities dispose us to new learning. They also change both our social identity (how others see us) and our I-identity (how we see ourselves). In short, experience is retained as memory, and abilities are drawn from the fruits of memory, not in a material sense but rather in the sense of process. At each stage, selection occurs according to values the person has. We remember from daily experience what we regularly encounter, what we attend to, what we deem to be important and what affects us and what we have been disposed to expect and notice. Experience is transient, memory is mutable but dispositions and abilities are sustainable and capable of growth. Learning to swim, ride a bike or read involves permanent changes in our bodily organisation, such as mastery of balance and coordination of movement and perception.

Steiner uses the analogy of digestion to describe learning more than once (e.g. in a lecture on 4th October, 1919). On eating bread our digestive processes free the forces within the food and use these as energy to drive our activity and nourish our processes of regeneration. We do not build our bodies out of the materials in the foodstuff but rather release the energy within them to generate our own substance and fuel our activity. The process of generating abilities from the 'raw material' of embodied experiences is analogous to this. Thus experience prompts activity. In his description of how teachers can develop intuitive insight through meditatively engaging with anthroposophical ideas about the developing human being, (Steiner, 1982), the same analogy is used to explain how the ideas taken in and contemplated transform into dispositions that enable the teacher to intuitively recognise the wider picture and thus inform her actions. He speaks of remembering (*erinnern*) in the sense of the ability of knowing-in-practice what the appropriate action is, based on an inner connection to the situation. What has been learned and has become disposition or ability

directs our attention to the actual phenomenon in a way that enables us to grasp the wider implications and connections that are not sense perceptible but locate the phenomenon in a bigger context, thus enabling us to 'understand' more, or literally enables us to take a new stance in relation to what we experience, from which we can grasp or apprehend it. We can only describe this process using metaphors.

Thus we have a picture of the complex roles that memory and recalling play in learning and identity and how memory is transformed into ability and that ability disposes us to not only see more but do more in a given situation. Being able to see and do more, gives us a new identity in relation to the world.

Knowing

Wagemann (2016) has argued that Steiner's pedagogy is closely based on his theory of knowledge. This particularly holds true, I believe, for his understanding of learning, which Steiner linked to the generation of knowledge, the development of memory, the growth of abilities and the self-development of the subject as agentic being. Space does not permit a full discussion of Steiner's epistemology and readers are directed towards accounts of this (Schneider, 1982, da Veiga 2016, Wagemann, 2016, Dahlin, 2017). However, a brief summary is necessary in the context of this paper.

In Steiner's early theory of knowledge, *Truth and Knowledge* (1963b), the human being is not a passive observer of world events, mirroring 'in here' what happens 'out there'. Rather we are co-constructors of reality. As Dahlin (2013) puts it simply, according to Steiner; knowledge + experience = reality. The construction of reality is located within the human mind-Steiner refers to the human soul as the stage for cosmic events (1996b). The 'I', as spiritual core of the subject, is the source of agency and is embedded both in the unified world of spirit and matter, and is also embodied in the physical human being. As the bearer of consciousness, it experiences the world empirically through the senses and it can experience the coherence of the world's structures intuitively in cognition. Following Steiner's epistemology, it is the nature of thinking to bring separate thoughts together into a relational unity, in which "all the elements are related to one another" (1968, p.44). All individual thoughts, he says, are part of the whole unified thought-world. This unity however can no longer be experienced under normal circumstances because our physical constitution causes the experience of separation between subject and object. Barfield (1988), interpreting Steiner, refers to this as separation from a state of original participation. However, in thinking, this unity can be achieved again, in a state Barfield calls final participation.

In his *Theory of Knowledge*, Steiner (1968) describes our initial experience of the world as a chaotic and "unrelated aggregate" (p. 34), and individual sense perceptions appear un-related, an ongoing sequence of events without meaning or context. What is needed is an act of thinking to organise the experience. Bortoft (1996), who like Steiner draws on Goethe, refers to the need for "organising ideas" that make sense of the percept. Thinking thus makes sense of experience.

In Steiner's account of knowing in *The Philosophy of Spiritual Activity* (1963a), the 'I' constructs percepts in the form of mental images on the basis of empirical sensory experience through observation and embodied experience and these are given meaning through a particular form of intuitive thinking in the form of a concept, whose source is the spiritual world of ideas. Percepts are subjective and individual whilst concepts are of general and objective validity, on the grounds that anyone, anywhere, given the same experiences and conditions, can think the same concept, as is the case for example in geometry. It is important to note that Steiner (1963a, p. 148) emphasizes that the word *perception* describes a process that is not limited to sense-perceptions, but includes everything that the mind encounters in terms of experience, including memories. More specifically, it is the experience of the 'I' *within* the experience that translates or interprets (Steiner uses the term *Dolmetsch* meaning both translator and intercessor) and gives meaning to the gestures of experience, a process through which, "the mute percept suddenly speaks a language intelligible to us" (1968, p. 52).

Some aspects of Steiner's theory of knowledge are relevant to understanding learning. Firstly, knowledge grows through the self-activity of the subject constructing individualised concepts in the form of

representations (Steiner, 1963a, p. 124). Put simply, our representations of what we know about the world can grow as we apprehend their relationships within ever larger contexts. Thus knowing can be described as a process of learning to relate what we know to a progressively more comprehensive and coherent whole. Furthermore, as Schieren (2012) explains, the constructed unity of concept and percept that takes the form of a representation plays an important role in learning because we can remember, link and combine representations. The knowledge process, and thus the learning process, extends in two directions. The concept is anchored in a general, nomothetic structure of meaning (what Steiner calls the world of ideas) and at the same time is individualised as the meaning of a specific percept. In other words, general concepts are individualised. It is these that grow as the learner becomes more experienced. They grow towards a more comprehensive and general knowing.

We can assume that as individualised concepts are reinforced through repetition they form dispositions or abilities to certain ways of seeing the world and certain ways of being and acting. Through learning new abilities and dispositions, we change our relationship to the world and other people. In other words, learning is a process of becoming. Thus we bring reality into being through the performative and productive act of constructing knowledge and in doing so, we bring ourselves into being. The 'I' is both agentic subject and brings its own subjectivity into being through evidential experiences (Loebell, 2000), which has the dual effect of enabling the individual to experience, "I know that to be true" and "I am the one who knows it". Such experiences call the subject forth and heighten subjectivity. This is not a process that education can directly influence. It can however create learning situations in which it is more likely to occur and it can scaffold these processes through recognition and support.

The role of language

One aspect that is often overlooked in accounts of Steiner's theory of knowledge is that the concepts that we intuitively experience have to be 'clothed' in a culturally shaped 'garment' of language and culturally specific symbolic forms if they are to be communicated (even with ourselves)- "what a concept is, cannot be stated in words" (Steiner, 1963a, p.76). Ernst Cassirer (1962) argued that before we can grasp concepts, we have to express our experiences in the form of symbolic imagination and intelligence using discursive symbols, such as gesture, language, signs, art, myth, religion and science. Indeed, Cassirer argues that symbolic thinking is the precondition for relational thinking that enables us to understand the connections and relationships between things, because even the act of configuring a perception requires the things to be recognized and given a symbolic form. This does not mean that reality is constituted by language, but rather, as Taylor (2002) puts it, "all intelligible reality is 'enhanced' or 'increased' by the words we find to comprehend it." (Taylor, 2002, p. 66). Taylor is discussing Gadamer's statement that, "being that can be understood is language" (2013, p. 474). Language enables us to understand reality and enter into discourse through it. This means that each act of knowing is performed by an individual but this activity is always embedded in a social and cultural context through language. Thus, although the subject brings forth the reality of the object in matching percept with concept, she always does so within a discourse shaped by symbolic language and cultural understandings.

As Fuchs (2008, 2013) points out, the structure of language also enables the separation of subject and object and thus interrupts our active but unconscious participation in the living world. Even though language strives to overcome this separation, it cannot fully replace participation with representation. What we learn cannot entirely be articulated by words. Something is left over that we can only enact. Although school learning is heavily dependent on narrative and text (including all forms of symbols), we should not forget the learning that is also pre-verbal and manifests in actions, non-verbal expression and relationships. Language skills are the precondition for conceptual learning, (including the experience of learning concepts in three languages -the mother tongue and two others from grade 1 onwards, as practised in Waldorf schools), but the learning process does not start with concepts but rather from experience. Not all of experience can be articulated in words which allows for the fact that something is left over, that cannot be conceptually framed but which can be experienced aesthetically. When we reify knowledge in words and

concepts we take possession of it. However, the part that remains is the being of the 'Other'. Adorno (1966) called this negative dialectics, within which the possibility exists, that the 'Other' can be recognized. We can strive to understand but we will never be able to do this completely and we should respect this. Art is a form of knowledge that can mediate meaning without defining what that meaning is (Gadamer, 2013). Ong (2002) has made the important distinction between the consciousness associated with forms of orality such as speech, poetry, story, myth and literacy, which enables rationality, science and literature. Orality is in many respects 'closer' to the pre-verbal source of experience and thus plays an important role in the learning process.

Thus learning is an aspect of knowing and knowing is about participating in world processes in progressively more comprehensive ways. From a phenomenological perspective we already participate in the lifeworld (Gallagher and Zahavi, 2012, Berger and Luckman, 1963). From the perspective of Steiner's theory of knowledge, the human being participates in the creation of reality because the human spirit is already embedded in the world and the act of knowing gives our participation in the world meaning. Our bodily nature gives us the experience of being separated from the world; we experience 'in here' what we see 'out there'. These metaphors refer to different perspectives. The act of knowing involves returning to the 'things' their meaning and reality. At the same time, we bring ourselves into being. Learning is thus a process of becoming.

A model of learning processes: life processes and learning processes

As Heusser (Heusser 2014) has suggested, throughout his works Steiner posits an interactive correspondence between the processes at work in the human organism and the processes in the mind. Following anthroposophical pedagogy, the body is not simply an instrument for the mind, but through the embodiment of the soul and spiritual dimensions of the individual, we are connected to the living world, just as we are connected to the spiritual world in consciousness (Steiner, 1996b). Both body and mind participate in experience. The 'I', as spiritual and permanent core of being, is agentically active in both body and mind and mediates between the spiritual/soul world and the living body (Steiner, 1996b).

In his unpublished work *Anthroposophy – A fragment*, Steiner (1996a) attempted to show that within the processes of sense perception, various life processes are at work in our bodies that come to expression in our mental activity. The correspondences between body and mind suggest an embodied mind and a body transformed by the individual mind and "social suggestion" (Berger and Luckman,1967), that is, a body, whose natural processes, such as breathing, digesting, growing, reproducing etc. that it shares with other mammals, are socialised and encultured through participation in social and cultural practices and modified through learning. In Steiner's terms, the life processes are part of the life-body, or formative-force-body (Steiner, 1996a). The human life-body, comprising a series of life processes, is an individualised part of the natural life-processes in the biological world. The nature of experience is portrayed as an interaction between sense organs, life-processes, soul and ultimately, the 'I'.

Underlying our sense experience of the world are seven life processes, which Steiner (1996a) describes as: breathing, warming, nourishing, secreting, maintaining, growing and reproducing. Dyson (2001) suggests that *separating* is a better translation for secreting, and *sorting* is also sometimes used. Space does not permit an account of Steiner's highly complex description of these processes. However, these ideas have been taken up by various authors (König 1999; Lindenau 1974; Rawson, 1999; Sahlmann , Weihs , & Urieli 1996; Stolz 2005; van Houten, 1993). Rawson (1999) aligned the life processes with the soul/mind processes, as follows:

1. breathing- perceiving
2. warming- experiencing sensations
3. nourishing – visualisation
4. secreting/separating/sorting – judging

5. maintaining – memory
6. growing –personality
7. reproducing –self-development.

Van Houten's (1994) interpretation of the seven life processes in adult learning, offered another variation. His sequence is as follows:

1. breathing – observing
2. warming – relating
3. digesting – assimilation
4. secreting(sorting) – individualising
5. maintaining – exercising
6. growing – developing new abilities
7. reproducing –creating.

In order to help the teacher to research the learning processes among her students, I have framed a series of heuristic propositions about learning. I briefly explain each of these, though these explanations are necessarily brief. I start with a characterisation of learning itself. Each proposition concludes with possible research questions. There are a whole series of preconditions for good quality learning. Space does not permit discussion of these, but I have published these separately elsewhere (Rawson, 2018).

Some propositions about learning

Lave (1997) suggests that any theory of learning must answer three questions; the relationship of the human being to the world implied by the theory, the telos, or direction of learning and the mechanisms by which learning comes about. Drawing on Waldorf learning theory and on the various interpretations of Steiner's work on the life processes that correlate these with learning processes, and on insights into learning from phenomenological and social practice theory approaches (see below), I attempt to answer these questions. I have found it helpful to think of learning in Waldorf contexts using the following propositions are heuristic tools:

1. learning is sustainable change of the whole person, body, soul and spirit,
2. learning has both a social and individual ontology,
3. learning starts with rich experience,
4. learning requires forgetting,
5. learning develops through narrative recalling,
6. constructing shared concepts,
7. and practice, applying what has been learned
8. leading to the growth of abilities.

Proposition 1*: Learning can be understood as sustainable transformation in the whole person as subject (body, mind/soul and spirit) over time and across different social practices through the activity of the 'I' as spiritual core of the human being. Learning is a process of becoming located within specific learning cultures.*

This characterisation of learning reveals its complementary nature. It draws on Waldorf theory but supplements this with elements of social practice (Lave and Wenger, 1991, Wenger, 1998) and phenomenological theory

(Fuchs, 2013, Meyer-Drawe, 2009). It does not significantly differ from the definitions offered by Göhlich and Zirfas (2007), Illeris (2014) or Faulstich (2013), except that it takes the spiritual dimension of the human being into account. These all describe a process of self-formation (*Selbstbildung*) in which the subject engages with and assimilates understandings of the world and in so doing, constructs identities. Anthroposophy posits a self as spiritual core of the human being, that is, agent and subject of activity. Following anthroposophical pedagogical anthropology (in German *Menschenkunde*), learning is part of the overall process of incorporating or incarnating, in the literal sense of embodying, the spiritual part of the human being into the living body, during which mind (in Steiner's terminology the soul) emerges through experience. The 'I' is active in all dimensions of this process from physical growth to intellectual development. As we have seen above, experience has two sources - sense perceptions and cognitive activity (Steiner, 1996b). The human being is embedded in and participates in the world unconsciously in willing and forms representations of the world in thinking consciousness. Feeling occupies a position between participation and separation with regard to consciousness.

Learning transforms the whole person, body and mind over time and across social practices, in what Illeris (2014) calls transformational learning. In practical terms, it is impossible to separate the mutual influences of body, soul and spirit in the learning process because changes in one area call forth changes in all areas, though synchronising the changes is an ongoing task of learning and development. Synchronising (or harmonising) implies the balancing one-sidedness within the psycho-somatic dynamic (e.g. physical exercise may build muscles or endurance but is not transformational unless it accompanied by new ways of thinking and feeling, whilst conversely, certain mental activity may have a deleterious effect on the body). Thus we need to distinguish transformational learning from more one-sided or superficial forms of learning that could be termed conditioning or training, in which external agency changes the person's reactions and behaviours.

Learning as becoming as a metaphor was coined to describe the learning of young adults (Hodkinson, Biesta & James, 2008) and was then applied to learning throughout life (Biesta, *et al*, 2011). It implies that learning goes hand in hand with identity work (i.e. the ongoing constructing resilient and coherent biographical identities) and ecological agency)the ability to act within the opportunities and restraints of a given social situation). This metaphor recognises that what we learn, can reinforce or alter what has been learned and can thus influence what we can subsequently learn, thus shaping the habitus (Bourdieu, 1990) of the learner and disposing her to certain new learning experiences. Habitus refers to embodied social positions and the behaviours and attitudes that are linked to these. This notion reflects Dewey's view that learning influences the formation of embodied "attitudes of desire and purpose… [and] every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had"(Dewey,1938, p. 36). Significant new experiences may change the existing body of habits. Dewey refers to this process as growth and development. Thus learning changes our 'I'-identity (how we see ourselves) and our social identity (how we are seen by others). Faulstich (2013) describes learning, which he associates with the idea of self-formation, as a lifelong biographical process of striving to establish identity by assimilating culture through learning and in doing so, developing personality.

Since learning in school, which is the focus of this paper, always occurs in a social context, we can understand it as a process of becoming (or self-formation) within a given social and cultural context and within specific learning cultures. Following Stuart Hall's discussion of identity and culture (Hall, 1996), this view of culture sees it as an expression of the actual actions, thoughts, feelings and relationships of its members and how these are positioned by the discourse (Hall uses the metaphor of suturing to suggest how the individual is 'sewn' into the discourse), rather than as a something of an abstract or essential nature. Following Hodkinson *et al* (2008), a learning culture is embedded in a community of practice (Wenger, 1998) and comprises the actions, attitudes, behaviour, expectations, assumptions and talk of the people within that community. A community of practice is a group of people who share tasks, experiences, language, tools and artefacts, rituals, ways of seeing and being.

In a Waldorf school the learning culture includes the curriculum as espoused (and expectations arising from this), curriculum as actually taught, the teaching methods, the class community and the school culture

(Helsper *et al* 2001). The explicit, actual curriculum is the visible side but there is also a tacit, invisible or hidden side to the curriculum, which comprises the unintended, unconscious ways that teachers and schools privilege some students and marginalise others (e.g. for social, cultural or economic reasons), in ways that Kelly (2011) has addressed. This kind of cultural perspective on learning de-centres and contextualises the learning process yet also gives a strong role to individual agency; people have to actively participate if they are to learn. The question is, whether the learning culture enables or hinders their participation. A Waldorf school is an educational culture that both shapes persons and is shaped by them. The way people learn, including teachers, generates the relationships and meanings that we refer to as school culture. As Lave and Wenger (1991, p. 35) put it "learning is an integral part of generative social practice in the lived-in-world."

Learning is also shaped by the experiences a person has had. Bodily maturation may follow a genetically determined sequence but the timing is culturally variable and wide individual variation in development is normal (Beglinger & Largo, 2005). We know from neuroscience (Hackman & Farah, 2009) that brain development is affected by socio-economic factors and that individuals respond in individual ways to this, notably in puberty (Foulkes & Blakemore, 2018). From a Waldorf perspective, development also reflects individual biographical dispositions (Wiehl & Zech, 2018). In schools, both learning and development are significantly influenced by the institutional structures (e.g. the Waldorf class system), particularly at moments of institutional transition from one set of practices to another (Fleer & Hedegaard, 2010), such as the move from kindergarten to first grade, or from Middle to Upper School.

In Waldorf pedagogy, the curriculum, which includes both the content and the teaching methods, is obviously a prime factor in shaping learning and development. Zech (2016a) refers to the curriculum in Waldorf schools as being structured around ideal-typical developmental descriptors that relate to the developmental tasks the students face. Thus the topics dealt with and the teaching methods, offer learning opportunities in which the students can respond to certain age-related developmental tasks. These developmental tasks are based on this heuristic model of development in the curriculum and also on teachers' understandings of the actual local social, economic and cultural context and individual learning and developmental needs. For this reason, Waldorf curricula around the world and over time will vary of necessity. This is a vital aspect of curriculum development everywhere in the world because it cannot be assumed that the same developmental tasks can be answered by the same curriculum everywhere in the world at any time. This is an under theorised area of Waldorf practice (Rawson, 2017, Boland, 2015).

Wiehl (2015, p. 169) uses the term *learning disposition* to describe how the individual's psychological and cognitive constitution that at any given moment in her development, shapes the way that person relates to and responds to her experiences and to the social and material environment. She points out that Steiner identified three basic and universal learning dispositions; imitation (age 0-6 years), following authority (6/7 to 14/15 years) and learning through the forming of judgements and learning from life (from 14/15 upwards). However, in my view it is always important to understand dispositions within the context of a specific learning culture rather than as essential or intrinsic traits possessed by a person. Even if we accept that these learning dispositions are inherent (e.g. the disposition to mimetic learning, see Wulf, 2007) in the young child), or latent (e.g. the disposition to seek authority role models in childhood), these dispositions still have to be learned in a specific context that offers learning opportunities for this learning. Learning cultures afford certain dispositions but also hinder others. Educators make conscious choices as to which dispositions they cultivate and the nature-nurture question is always at the heart of all pedagogical theory.

Thinkers such as Michel Foucault, Judith Butler and Stuart Hall have changed the way we think about identity and the self-though this influence is barely apparent in the Waldorf discourse, which generally tends to assume an individualistic, essentialist 'I'. Most contemporary educational discourses recognise that people are positioned through their social interaction. Lachicotte (2009) notes, "the subject-in-action, the 'I', has no (in fact, cannot have) immediate knowledge of itself. In order to understand oneself, one must respond to oneself as an object, as a 'me'. Yet the only models in experience for such self-response are the responses of other people" (2009, p. 225). Thus identity is always relational- we see ourselves in relation to others and how they see and respond to us. As Bakhtin (1981) put it, self-consciousness is always dialogical. Postmodern and post-structural theory has sought to refute the notion of an autonomous, self-determining,

essential self, and has replaced it a dialogical, social self , or rather a diversity of selves, or selves in different contexts with ecological, experiential, ontological and emergent, social and spiritual selves (Gallagher, 2011). Whatever theory of self we choose, learning, becoming and identity all require some notion of agency. I think Biesta and Tedder's (2007) notion of agency is helpful in seeing agency as something that is not given but has to be achieved through active engagement of individuals within contexts-for-action, or what they call an ecological understanding of agency. This notion comes close to Alheit's (2018) construct of biographical learning, which requires a reflective ability to construct biographic narratives in response to the opportunities and limitations afforded by the given context, and indeed how the individual can changes those circumstances to take advantage of them for learning.

This proposition about learning invites many research questions. One can seek to identify what notion of learning fellow teachers in a faculty (or indeed what parents) have, since attitudes to learning shape the learning culture. Another research question is to explore how we can identify and work with different understandings within a learning culture. Curriculum development is a vitally important aspect of Waldorf pedagogy, which has barely begun to be recognised as an issue, either because of naïve views that the curriculum is a given and canonical set of standards, or because teachers teach what they subjectively feel is important.

Proposition 2. *Learning occurs through participation in social practices and has a social ontology but requires an active subject*

I take a relational view of the human being and thus of learning. This stance seeks to overcome the notion that learners somehow internalise knowledge as something pre-existent. Rather, a relational, social practice perspective understands that "the production, transformation, and change in the identities of persons, knowledgeable skills in practice, and communities of practice are realised in the lived-in world of engagement in everyday activity" (Lave and Wenger, 1991, 47). A relational perspective emphasises the interdependency and mutual formation of persons and the social and cultural worlds. Activity, knowing, meaning, and learning are part of this interaction. Instead of the dichotomy of inside and outside implied by internalisation, learning is seen as the process of developing trajectories of participation. Learning is inseparable from the process of persons becoming through experience and understanding are always in an ongoing cycle of mutual formation involving the person and social context. The person is the focus of this approach to learning, but we must always see the person as a person-in-the-world. In typical child-study approaches in Waldorf schools, there is sometimes a tendency to look at the child separate from the pedagogical and general life situations the child is embedded in. The one cannot be understood without the other.

Participation in a social practice mediates to the learner, more than simply knowledge. Following Wenger (1998), learning in a community of practice involves meaning making (i.e. our individual and collective ways of experiencing the world as meaningful), social belonging through shared learning, identity (i.e. how learning changes who we are and our personal histories of becoming) and learning as doing (developing abilities and becoming skilled). A community of practice is a group of people who - share experiences within a common social framework, participate in a joint enterprise with its rhythms and common activities, have mutual engagements and relationships, a shared repertoire of stories, language, artefacts, a shared history and discourse. This characterisation matches a class in a Waldorf school. Here the participation is usually long-term, involving many rituals, rhythms, ways of being together and shared activities over many years leading to the growth of a Waldorf habitus (Idel, 2013).

Participating in a community of social practices- and people belong to several overlapping communities- involves the members initially in a peripheral position within the community. Through their participation, their trajectory (how they move through life) leads them, as a rule, towards more comprehensive participation and expertise in the practices that characterise the community and thus also to the further development of that community. Even though individuals are differently resourced and positioned within a community, which in a school class may show itself in differential levels of ability in the various subjects and in different

family backgrounds, novices nevertheless become full members over time, regardless of their individual abilities. In a Waldorf class seen as a community of practice involving ritual, rhythm and the structured reinforcement of relationships over space and time, we would normally expect a culture of fluid collaboration involving shared understandings leading to "complex engagement and construction of shared reality among participants [that] is not the result of combining individual characteristics or experiences. Rather, it is mutual sharing of a common way, a common understanding… The individual acts with commitment to exercise communality, engaging in the ways of the group and potentially modifying them in the process" (Mejia-Arauz, *et al* 2018, p.121). A clue to understanding the task of inclusion is recognising this principle and all members of the community doing their best to make it possible for all others to participate.

Thus the primary mode of learning is participation. Knowledge-making involves participation with the world, with other people and their thoughts, feelings and intentions, with and through language and symbols and ultimately, anthroposophically speaking, with the world of ideas in which we are all embedded. Barnes and Lyons (1979) describe the overall learning process in a Waldorf context as first involving an encounter with the world, "then encounter becomes experience; and out of experience the concept crystallises. Encounter, experience, concept – perception, feeling, idea: these are the three steps in every genuine learning process" (1979, p.7). Loebell (2000, 2016) describes this process as three stages of participation in experience; attention and interest (*Aufmerksamkeit*), commitment (*Verbindlichkeit*) through which the learner unites herself to and 'owns' the experience, and then the individual's experience of evidential knowing through insight (*Evidenzerfahrung*). This perspective emphasises the individual experience. However, as I have argued, the social and cultural context is equally important.

The primary research task is to explore the ways in which rich experiences can be facilitated and the extent to which the practices enable all participants, whatever their resources and differences, to participate to the best of their abilities. Rogoff (Rogoff, 2014) offers several criteria for assessing the conditions for participation. These are:

1. The learners are incorporated in and contribute to community endeavours.
2. The learners are eager to contribute, collaborate and belong and each member is willing to help others.
3. The activities are organised so that all can participate.
4. The goal of the learning situation is participation so that all can contribute, allowing others to participate, taking responsibility and contributing to belonging.
5. The learning occurs through keen attention to and contribution to events, guidance is provided across the community and there are expectations that people will learn in the learning culture.
6. Communication is based on shared reference in collective endeavours through verbal and nonverbal communication and narratives and dramatisations are used to convey values and explanation is always in the context of the shared activities or in anticipation of such.
7. Assessment for learning is used in relation to the collective endeavour.

Each of these criteria can be used to explore pedagogical learning situations. I used these criteria to evaluate the learning processes in three Waldorf institutions in very different cultural settings, Vietnam, Lebanon and Kyrgyzstan, in a way that shows the general applicability of the model (Rawson, 2017, 2018).

Proposition 3*: the basis for learning is rich experience.*

Learning begins with rich sense experience through listening, observing and participation. Rich means experience that is direct, authentic and multi-sensory. In order for transformational learning to occur, there have to be significant experiences that interrupt, discontinue or challenge existing embodied experience. We start to learn when what is known is no longer adequate. The new experience must require the learner to readjust what they know. Meyer-Drawe (2012) uses the Greek term *pathos mathei*, which means literally

learning through suffering or being moved (e.g. in the context of Greek theatre). She argues that we do not learn through experience, but that learning is experience.

Learning can thus occur through active participation in a social practice, experimentation or through active imagination (e.g. prompted by the teacher's narrative, text or images). In Waldorf practice, the learning process is structured so that the students first experience something and then, in subsequent steps, come to an understanding of that experience (Avison, 2016). They first have to form a perception of the phenomenon. This proposition refers to the first stage in the learning process, in which the initial experience is made (subsequent stages are discussed below). Not only should the experience be rich enough to make a strong impression, but it is important that the encounter with the new experience occurs within the community of practice.

The notion of starting learning with experience (rather than with a concept or definition) requires us to have a comprehensive understanding of the nature of perception, which is why Steiner (1996b) developed a pedagogical theory of 12 senses and did research on the processes behind the senses and how this relates to his theory of knowledge, which I have referred to above. From a phenomenological perspective, perception, movement and knowing cannot fundamentally be separated as functions (Fuchs, 2013). The body, in Merleau-Ponty's (2005) terms, is an ensemble of capabilities to perceive, to act, to desire and to communicate that have been learned and these depend for their expression on what the environment affords. Following Gibson's (1986) ecological understanding of perception, learning involves a schooling of attention to the affordances in a given environment. Therefore, teaching methods are required that involve heightened awareness and accurate observation, so that the learners notice what is important to understand the situation. Marton (2015) makes the case for an emphasis on noticing differences rather than similarities, because what is different stands out from the pattern. Through active engagement with the real world through doing and communicating, the students learn to recognise and identify differences in the qualities of the things they encounter using as many senses as possible to build up rich experience.

A key pedagogical research question is exploring how children actually experience the main new content in lessons and building up a taxonomy of experiential learning, by for example, exploring the differences between direct seeing, hearing, doing and indirect methods using narrative, texts, images and other media, e.g. how much primary experience of nature is needed for learning related to the natural world?

Proposition 4 Forgetting is an important part of learning

One of Steiner's most important ideas related to learning is the role of the unconscious. Remembering and forgetting are part of the overall rhythm of what Steiner (1996a) refers to as sleeping and waking, in which the soul and spiritual parts of the human being engage and disengage with the living bodily organism, a process that is accompanied by different levels of consciousness. In sleep the soul-spiritual dimension is unconscious because it is disengaged from the life and physical bodies. In this state, however, the experiences of the day continue to resonate in the unconscious. The same thing occurs when we direct our consciousness towards something else; the experiences we have just had, become unconscious. The impact of the experiences, comprising sensations, perceptions, feelings, thoughts, language and actions on our sentient soul (as Steiner calls the process and location of our response to sense experience) can unfold and are now uninhibited, as it were, by further new experiences and the focus of our attention, and thus go on reverberating.

Fuchs (2013) makes the important point about the unconscious that it has less to do with the *depth* of soul experience but rather with the *horizontal relationship* to space and in particular to our lack of awareness of the relationships between things in our normal consciousness. When we are attending to our immediate experiences, we are not usually conscious of the whole context and the relationships between the things around us. We experience the world anew, initially as an undifferentiated totality. We give it shape, perspective and dimensions to our perceptions through comparison with the knowledge we have already embodied. Steiner (1996) says that our ability to form mental images of what we experience is possible because our pre-bodily experience is already pre-figured and is thus innate, though the capacity to form mental images at will is

only available after the second dentition. That means the ability to conceptualise, though innate, becomes possible only once the life processes have undergone a transformation into soul processes.

From an anthroposophical perspective, the 'I' is already embedded in the relationships in the world, though the conscious mind is not aware of this. We are not aware of everything we perceive and experience. Looking more closely at this situation we can see that during the original encounter with the phenomenon, we were not separated from the object of our interest because our will unites itself intentionally with it through our various senses. The phenomenological notion of intentionality (Gallagher and Zahavi, 2012) says that in the act of perceiving what is given to us by the world- the phenomenon- involves entering into a relationship between subject (perceiver) and object (perceived). Through intentionality we enter into a relationship with what we see, hear or otherwise perceive, which alters both subject and object. When the object is another person or sentient being, that relationship becomes a shared intentionality (Tomasello and Carpenter 2007).

When we are asleep or unconscious (or our attention is directed elsewhere) the connection is retained, though it is freed from sense impressions. Following Steiner's account, an experience we have during the day, for example in a lesson, resonates on in the unconscious. Our unconscious will remains bound up with the experience and in particular with the relationships that belong to the object, including of course, our relationship to the original experiences, the feelings that were activated and the way we perceived the original encounter, the senses involved being linked to various life processes. However, another important factors plays into this process.

The teacher has already made a significant connection to the subject matter that forms the content of the rich experience. She has selected specific elements in her presentation and arranged the learning situation in an artistic way to optimise the effect of the experience. The encounter is not casual or accidental but intended, guided, shaped and framed (here the analogy with a work of art is helpful, not least because it wishes to make something invisible, visible). Furthermore, the teacher has specific aims in bringing this material to this class at a particular time-in other words she has specific intentions with a specific group of children. Thus the teacher's intentions and intentionality play important roles in directing the children's attention to the salient aspects of what is to be learned in the actual situation. There is a qualitative difference between an accidental encounter with the world and the rich experiences that have been selected, scripted, organised by someone. The experience comes to the students in a form that has already been shaped through the teacher's activity and consciousness. In the same way a photograph taken, selected and perhaps modified by a professional photographer often has greater depth of impact on the viewer than a 'selfie'. Teaching as an art involves precisely this deliberate choice and planned presentation of 'material' that conveys meaning, without specifying what that meaning is. The children's task is to experience and articulate the meaning in subsequent learning stages.

This directing of attention and intentionality 'directs' the child's unconscious 'I' (unconscious though active) to the phenomenon. It is not that the teacher directs their attention explicitly ("look at this, it is important"), but rather in her preparation, this focus is highlighted and the directing is implicit. Because Waldorf teachers select and prepare their teaching material themselves, as opposed to using textbooks or material prepared by others, their subjective involvement with the material is intensive. When they have prepared their lessons and meditatively focused on the essential "message" they wish to communicate, in the context of a basic relationship of trust between students and teachers, this intentionality resonates in the children's unconscious, along with the experiences they have had in the lessons. Part of the art of teaching is being clear what the core 'message' is, and thus to construct the lesson in such a way that the students tacitly understand this 'message' too. That is why, as Biesta (2012) points out, it is important that children and young people learn *something* from *someone*. The teacher's being mediates between the child's being and the being of the subject matter (as a meaningful part of the world). The child is already embedded in the living world and the cultural lifeworld of meanings; her organs of perceptions are permeated by the life processes that belong to the world. The teaching directs the child's attention to the relationships and strengthens them. These relationships are woven together in the sleeping, unconscious mind, where the interests and

intentionality of the other participants in the learning community also mingle. The next stage is to make the process more conscious.

An important research task is to review the relationship of "well-prepared" teaching material to the subsequent recall of the experiences. Another is to explore how teachers determine how they select the priorities in their choice of material and indeed the whole process of preparing lessons.

Proposition 5*: Individual and social processes of recalling, re-telling, re-constructing and giving meaning to experiences*

When we recall the experiences, we reconstruct them from our memory. The reconstruction however is no longer identical to the original experience, but has been modified in ways that are relevant for learning. Steiner (2007, lecture 11) speaks of remembering as the recalling of sequences of deeply embodied images and raising these to conscious ways of seeing. This involves an act of will that is strengthened by the intensity of our interest and engagement and the feelings generated by the experience and thus the identification with the original experiences. Steiner uses the example of zoology and the students' encounter with certain animals through the lively, vivid and artistic presentation by the teacher. He also refers to the teacher narrating history in such a way that strong identification by the students occurs. He contrasts this way of experiencing with the taking in of dead concepts that burden the memory and lame the will.

Following Steiner (2011), re-calling an experience involves constructing a new perception, though internally rather than through the senses. This activity requires an act of will or agency on the part of the subject (as opposed to a spontaneous memory). It is therefore important that each student performs this act for herself. Simply taking notice of someone else's memory is insufficient. Walter Benjamin (1928) offers an insightful analogy for this process. He compares the experience of looking down on a road from an aeroplane to walking along the road. The power of the experience and the insight one has into the locality is obviously much greater when one walks through it. He then goes on to suggest that the act of reconstructing a text or an experience involves a strong identification and thus deeper insight. It gives the student 'command' over her experience. Benjamin (1969) offers further insight into oral communication and the realm of what Ong (2002) later called orality. Benjamin speaks of an artisan form of storytelling, in which experiences in the workplace are recounted and shared. This generates and circulates meaning and affirms the practical life of the community, thus sharing and imparting knowledge to all the members of that community. Such storytelling "presupposes a situation where someone is sharing a story with listeners who in turn take up that story and make it their own" (Pereira and Doecke, 2016, p. 539). This is exactly the function of recall in a Waldorf class.

Thus, each student is encouraged to recall the experiences of the previous lesson for herself. Individual agency is important, which is not achieved when only a few students do the active recalling. The function of the recall is not simply and pragmatically to reconnect the class to "where did we leave off in the last lesson?" but has the more significant function for each individual to reconnect to her own embodied experiences, since it is *her* personal abilities we are trying to enable to grow. Re-calling embodied experiences initially in a non-verbal way may draw closer to those embodied experiences because as soon as experiences are verbalised they change their meanings (Kelly, 2011). This can be done using drawings, making models or enacting.

When people recall what they have experienced they usually do this in narrative form. Bruner (1990) has established how human beings structure complex experiences in narrative in order to give them meaning. In the recall part of the lessons, the students are either re-telling what they have been told or they are recounting what they directly experienced. In doing so they draw on their own embodied previous older experiences, which already contextualises the new experience being recalled. When re-telling the story the student participates in the experience of the original story-teller, which is why teachers present much of the material orally rather than in text form. In orality the teacher's inner connections to the material are more authentic and vivid. It is a quality of orality that speaker and listener are embedded in the same process (Ong, 2002). The re-telling is also never a mere reproduction but a re-creation, what Reason and Heinemeyer

(2016) call *creative copying*, a process in which the teller makes the story her own, whilst remaining faithful to the original in its intentions and forms. These authors have coined the phrase *storyknowing* to characterise the kind of knowledge that is borne in story form. Re-counting an experience orally also generates a form of storyknowing. In order to get from storyknowing to conceptual knowing several further steps are required.

One way of prompting recall is to address questions to different temperamental types, for example, asking about elements of the story or experience that invite a melancholic or choleric perspective. Power (1988) has suggested using different modes of recall in the upper school classes, which he relates to archetypal planetary qualities, for example, as a *Venus-quality* of recall, which focuses on the emotional and relational aspects of the experience, or a *Mars-quality* of recall that focuses on essential actions and outcomes.

The next step is to share verbally those recalled experiences in the class. Here the students experience a wide range of variations and details they themselves had not noticed. At this stage the teacher can also correct, modify or supplement the memories of the class. In effect a kind of collective cultural memory (Assmann, 2011) is being constructed, in which "our" experiences are given meaning through sharing, repetition and ritualising.

Through language we are inducted into the historicity of words and their sedimented, intuitive levels of meaning. Reciting and working with poetry is particularly important in these terms. A text such as the following passage from Shakespeare's *Macbeth*, experienced and then unpicked to reveal the images within it, connects the student to concrete experience, metaphor and practical wisdom and spans the gap between intuitive orality and analytical literacy: "Macbeth hath murdered sleep! Sleep that knits up the ravelled sleeve of care, balm of hurt minds, chief nourisher in life's feast….". Placed into the context of the play and Shakespeare's life and times, we excavate archaeological levels of human collective and personal experience through the medium of language. Steiner (1995) made the point that engaging with the ideas living in such images can enable adolescents to access the pre-verbal, spiritual dimension of the world of ideas, from which they can derive the energy they need to create their own ideals. Learning two other languages from class one onwards provides children with two further strata of linguistic experience, which enables them, among other things, to have three perspectives on common concepts that do not overlap but create a fuzzy and thus malleable experience of approximate understandings. (Zech, 2016)

Explaining experiences to others using words means to some extent objectifying and reifying them. Indeed, to follow Dewey (1933), the reflective reconstruction of experience is located in the social sphere. Understandings are the outcome of communication and following Cassirer (1962) communicative knowledge is conceptual, symbolic and linguistic. Wenger (1998) points out that the interplay of individual and social memory involves the weaving together of two strands of experience, that of participation and reification. Participation is action-in-the-world and is largely un-reflected. Reification (literally meaning making into an object) involves "our constructing physical, procedural and conceptual artefacts- words, tools, concepts, methods, stories, documents… that reflect our shared experience and around which we organise our participation" (Wenger, 2010, p.179). The interweaving of these two strands over time helps to define both identity and belonging within a community of practice. The community understands what matters and enables the participation of its members. It uses the repertoire of resources the community has accumulated over its history to enhance its practices. Experienced in this way, the recall process not only shares and clarifies, it also reifies and consolidates the experience of the community.

The final stage of recall and reconstruction is when the class characterises the essential aspect of what has been experienced and then formulates a concept or rule. This shapes the collective understanding of the phenomenon- "how we understand this". In the upper school, the students exercise their powers of individual judgement in various ways, though this also involves the formation of negotiated and agreed judgements (Zech, 2016b). At this stage, the students compare their "discoveries" with those of their cultural predecessors, the scientific tradition and the range of possible theories that seek to account for the phenomenon. The point about concepts being constructed throughout the twelve years of the curriculum is that the class revisits concepts again and again, each time expanding and modifying them in the light of new understandings- what can be referred to as a spiral curriculum. Thus these concepts need to be

capable of growth and development, rather than fixed definitions that have to be replaced in the light of new knowledge. Thus we have a dynamic growth of conceptual understanding that is distributed among the members of the community through social interaction and communication. These draw on existing cultural concepts that are distributed across cultural artefacts (e.g. books, educational institutions) and mediated through language, in which cultural understandings are sedimented (Barfield, 1967). Knowledge is also part of individual evidential experience (Loebell, 2000).

A research task connected to this proposition could be looking at actual ways of recall in the various subjects and exploring ways of strengthening both the individual and shared processes.

Proposition 6: *Learning grows through practice and applying what one knows*

Through the systematic application of what we know to similar situations supports the process in which what is retained in memory is transformed into ability. This process is akin to Vygotsky's (Vygotsky, 1978) notion of the zone of proximal development in which the learner can attain a new level of learning with the progressively reduced support of a more competent other person. Thus a series of tasks can be given to the learners in which the application of what has been learned becomes progressively self-directed. A first stage is simple reproduction; a second may involve applying a known pattern to similar situations. A third level of task is to recognise differences between situations (Marton, 2015) and a fourth level is when the learner frames her own questions and provides her own answers. When the student knows how to deal with a phenomenon, interpret it and take up a position, when she can "play" with it, one can say that she has developed an ability.

Ultimately, abilities change the way we see the world. If we take Steiner's example of the ability to read and write, then we can see that many experiences in a particular field can lead to the development of a particular ability, which by its nature is more generalised than the specific experiences. Following a successful chemistry main lesson block, the learner will relate to the world of material processes differently and may be able to draw on this to construct conceptual metaphors meaningfully in chemical processes, such as combustion, reduction or catalysis for example. This is ultimately the idea behind the block-principle (epoch) in Waldorf schools, in which a theme is intensively experienced over four weeks (two hours each day) and then allowed to be 'forgotten'. Some subjects are experienced only for one or two blocks a year, which means that the period of forgetting can be half a year or more. What do teachers expect students to 'remember' after such a long time? Very few specific facts will be retained after such a long time, so the function must be to facilitate the growth of abilities rather than build up a body of specific knowledge that can be recalled. However, there is an obvious ambivalence about this process, since some subjects are deemed to require continuous regular weekly lessons and some subjects that are taught in blocks are supplemented by 'practice' lessons. It is as if teachers do not fully trust the system and do both. This is a very under-researched aspect of Steiner pedagogy. Is it clear what the distinction is between occasional blocks and subjects that are more frequently taught and what the expectations of both are? Sievers (2018) has made a strong case for block teaching in English as a foreign language in the upper school (and indeed many schools teach in alternating blocks in the lower and middle school). Other teachers insist that foreign languages can only be learned in regular lessons- evidently they are basing this judgement on quite a different understanding of learning.

Another research task in relation to this stage of learning would be to monitor the stages of emancipation from the teacher's scaffolding to the growth of ability. An important part of formative assessment is observing and giving feedback on this stage of learning. Indeed, summative assessment assumes that the learner has "learned" what she should and has mastered it. If the growth of ability is the actual aim, how can this be appropriately assessed and 'tested'?

Proposition 7. *Learning ultimately leads to the transformation of the whole human being*

When we have thoroughly learned something, we are transformed; or rather we are in a process of on-going becoming. As Loebell (2000) has shown, there are close links between the stages of learning and the

emergence of individuality. When the whole person changes we can probably recognise this in her overall maturity.

Our primary research task in relation to this level of learning is to note how students change in their overall development over time, perhaps each year. It is actually the function of the annual school report, to characterise the changes in a person over the past year and point towards new challenges in the coming year. What form can long-term formative assessment take, if it is to make this becoming of the person visible?

Conclusions

Do these propositions answer Lave's (1997) requirements for a theory of learning? The learning approach based on Steiner's theory of knowledge involves a participatory epistemology that sees the learner/knower as a co-creator of reality- the other creators being the nature world and the social world and, in the classroom, the learning community. The direction of learning is on the one hand the reintegration of knowledge into increasingly comprehensive understandings, and on the other hand, involves the emergence and growth of the person. Learning is thus the motor of growth and development and the emergence of individuality. The parts of the world we perceive are given back to the world as a whole and in the process is given meaning. The primary mechanism of learning in school settings is participation across changing practices and the individualisation of evidential knowing.

In this paper I have attempted to outline a complementary and provisional theory of learning in Waldorf practice that builds on anthroposophical insights as well as other ideas. The purpose of the propositions is to focus practice-based reflection and research. In the course of such research these propositions can be tested as to their usefulness, modified or abandoned and new propositions formulated. The purpose of the paper was also to elicit a critique. No doubt those who know better than me will provide this.

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El rubicón como un fenómeno de desarrollo en la infancia media[1]

(Primera parte)

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En debates públicos sobre educación Waldorf se manejan por lo general ciertas ideas como formas de explicación. Hoy en día un número significativo de personas asocian la Pedagogía Waldorf con palabras centrales como "euritmia", "enseñanza en bloques de asignaturas" o "aprendizaje sin calificaciones". Sin duda, entre estos términos hay una idea más o menos difusa sobre el concepto "rubicón", como la crisis que ocurre antes de la pubertad. Este tema se encuentra en debate incluso en foros de padres (Blass 2013).

Este artículo intenta establecer el concepto de "Rubicón" en su contexto histórico y luego identificarlo como una consecuencia del pensamiento antroposófico-espiritual sobre el desarrollo, tal como lo estableció Rudolf Steiner desde 1907 en adelante. La intención en explicarlo de este modo es poner en manifiesto las principales características de esta transición tan importante en la infancia, tal como fueron vistas por el fundador de la antroposofía. Luego entraremos en el ámbito de la teoría de la socialización actual con el fin de dar una explicación concisa sobre los ideales de Steiner acerca de cómo enseñarles a niños de ocho a once años de edad. Finalmente, queremos establecer el concepto de rubicón dentro del pensamiento actual en la psicología del desarrollo sobre el tema de la infancia media.

La historia del concepto "Rubicón"

En tiempos históricos el Rubicón era un río que marcó la frontera entre el corazón de Italia y la provincia romana de la Galia Cisalpina. En el 49 A.C. Julio César cruzó el río Rubicón con su ejército, en contra de los deseos del Senado Romano. Este acto fue efectivamente una declaración de guerra contra el Senado, el cual no puedo haber sido en retirada – a lo cual César reconoció con la famosa frase "alea iacta est" ("La suerte está echada"). Desde entonces, la expresión "cruzar el Rubicón" se ha consolidado como una metáfora de la acción o evento irreversible que puede traer consigo grandes cambios y un alto grado de riesgo. En la ciencia este concepto ha sido dos veces puesto en servicio dentro de un lugar destacado: en la cuenta del desarrollo humano propuesto por Rudolf Steiner a partir de 1919 en adelante, y en la teoría psicológica de acción de Heckhausen y Gollwitzer (1987).

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El modelo Rubicón de las fases de acción busca dar cuenta de los factores mentales involucrados en la transformación de una decisión, una vez tomada hasta su realización. La primera fase (predefinida) se caracteriza por una ponderación de los riesgos. Una vez que el sujeto se ha comprometido a llevar a cabo un objetivo en particular, la fase de evaluación del riesgo no puede ser prolongada indefinidamente, y su interrupción consiguiente es lo que lleva, entonces, a la realización de la acción, con los riesgos imprevistos que podrían acompañarlo (Achziger & Gollwitzer 2009, p.151).

Steiner también utiliza el concepto "Rubicón" por el potencial de asociaciones históricas que este término ofrece para construir un marco metafórico aplicado al evento de desarrollo en cuestión. En la fase intermedia de la infancia[2], alrededor del noveno o décimo año, según Steiner, hay un momento decisivo que conduce a un sentido más profundo de sí mismo. Una vez que los niños han pasado por esta fase tensa, pictóricamente hablando, no hay vuelta atrás de donde vinieron; es decir, de esa mentalidad infantil de identificación imitativa con el mundo adulto. En la estructura de su conciencia, como César, ellos han llegado a un punto de no retorno, desde el cual el camino conduce en una dirección: la dirección de etapas adicionales y secuenciales en el desarrollo de la identidad individual.

Además de esto, el rubicón puede interpretarse como una repetición de una fase anterior conocida como "los terribles dos", un término que hizo su debut en las primeras etapas empíricas de la psicología del desarrollo a principios del siglo XX. En su libro "*Erziehung zur Anthroposophie*" (Educación hacia la Antroposofía), Klaus Prange sostiene que Steiner se apropió de este concepto y lo "transmitió como parte integral de la antroposofía" (Prange 1985, p.109). Helmut Zander, citando a Prange, repite esta afirmación (Zander 2007, Vol. II, p. 1405). Aunque ninguno de estos autores proporciona prueba de ello, creemos que dichas observaciones están en orden.

Existe una clara evidencia de que desde la década de 1880 hasta la primera década del siglo XX, Steiner se interesó profundamente por la nueva ciencia de la psicología que estaba tomando forma, absorbiendo gran parte de su literatura. Esto se puede ver en su propio trabajo publicado. Ya en "una teoría del conocimiento implícita en la cosmovisión de Goethe", Steiner esboza los esfuerzos que se realizan en toda dirección para comprender el funcionamiento de la mente humana en términos empíricos y con el fin de explicarlos sistemáticamente. A través de todo esto, según Steiner, la psicología fracasó consistentemente en desarrollar un concepto unificado de la vida mental. Además, la distinción entre los aspectos "psíquicos" y los aspectos noéticos de la función mental ya no se podía mantener, lo que significaba que se estaba erosionando la apreciación de la identidad humana como inherente a la individualidad. Con el auge del darwinismo, entonces, el desarrollo se consideraba cada vez más en términos de biología evolutiva. Dentro de este contexto general, Steiner siguió las publicaciones de psicólogos particulares, como Wilhelm Preyer (1841-1897), quien aunque abrazó la teoría darwinista, rechazó con vehemencia algunas de sus consecuencias materialistas. Preyer se mantuvo firme en su convicción de que el alma no podía ser considerada como un epifenómeno de procesos puramente biológicos. Sus observaciones sistemáticas de los niños en la primera infancia lo llevaron a postular que en la filogenia la razón genera lenguaje y que, por consiguiente, en la ontogenia humana el recién nacido "viene al mundo mucho más dotado de comprensión que con talento para el lenguaje" (Preyer citado por Eckardt 1989, p. 37). Preyer sostenía que la razón es un poder formativo innato que, en interacción con su base corporal y con el medio ambiente, se precipita en habilidades particulares (Preyer 1989, p. 271; Eckardt 1989, p. 37). En su obituario sobre Preyer, Steiner elogió este enfoque como una contribución significativa a la psicología (Steiner 1989, p. 346). El libro de Preyer "Die Seele des Kindes" (El alma del niño), publicado por primera vez en 1882, aún es considerado el trabajo fundador de la psicología infantil empírica.

Después del cambio de siglo, Steiner en su ensayo "Moderne Seelenforschung" (Investigación moderna del alma, 1989) intenta delinear algunas de las principales corrientes de la psicología empírica. Incluido,

2. La infancia media, también conocida en el mundo de habla inglesa como "niñez media", es una fase de desarrollo que atrae cada vez más a los investigadores. El llamado período de latencia, bien conocido en la literatura psicoanalítica, que significa una pausa en el desarrollo psicosexual entre las edades de 6 y 12 años, ahora se ve de una manera más compleja. En la "mitad de la infancia" surgen desafíos de naturaleza tanto intrínseca como extrínseca, que son altamente significativos para el desarrollo de la personalidad del niño. Los límites temporales para la infancia media de ninguna manera son fijos puesto que fluctúan entre las edades de 6 y 8 (comienzo) y 11 y 12 (final, comienzo de la pre-pubertad) (Ahrend 2002, p. 17).

por supuesto, el campo de la psicología experimental y su principal representante en Alemania: *Wilhelm Wundt*. Aquí Steiner hace un comentario que muestra cuán profundamente consciente estaba de la amplia reputación de esta nueva ciencia, que tuvo lugar en el instituto en Leipzig fundado por Wundt:

> "De todas partes del mundo civilizado, los estudiantes encontraron su camino a Leipzig para aprender los nuevos métodos bajo la guía de Wundt. Y estos métodos modernos de investigación psicológica se han diseminado ampliamente. En Copenhague y Jassy, en Italia y América, la psicología experimental se enseña en el espíritu de Leipzig" (Steiner 1989, p. 468).

Entre estos estudiantes estaba el psicólogo estadounidense y teórico de la educación Granville Stanley Hall (1844-1924). Hall pasó cuatro años de estudio e investigación en el laboratorio de Wundt, y después de su regreso a los Estados Unidos trató de aplicar los frutos de este trabajo. Por lo tanto, se propuso desarrollar un método adecuado para recolectar grandes muestras de datos basados en la observación psicológica para procesarlos sistemáticamente. Con la invención del cuestionario tuvo éxito en este objetivo. Hall es correctamente considerado como el fundador de la indagación con cuestionario (Kreppner 1998, p. 130). Con este instrumento creado, llevó a cabo la primera gran investigación de aspectos del desarrollo infantil. Sus estudios principalmente analizaron los pasos que el niño toma en el camino hacia el desarrollo de la individualidad. Las descripciones detalladas de los fenómenos se procesaron sistemáticamente y se agruparon tipológicamente, y gradualmente surgió un modelo de desarrollo infantil basado en fases.

La teoría de Hall distinguió cuatro fases (Cizek et al. 2005, p. 8), llevando al niño desde la infancia hasta la autonomía del joven adulto. Estas fases son: infancia (0 - 4), niñez (4 - 8), juventud (8 - 12) y adolescencia (11/13 - 22/25). Las fases de la juventud y la adolescencia son períodos que implican cambios importantes que pueden hacer sentir su presencia en tensiones internas considerables. Además, Hall había llegado a ver que el lapso de este proceso de desarrollo se repite inconscientemente en capítulos significativos de la historia humana. Esta concepción ya era conocida como la "teoría de la recapitulación biogenética" (Cizek et al., 2005), una versión espiritual que fue presentada por Steiner.

Las investigaciones de Hall fueron muy influyentes y, a su vez, estimularon la psicología empírica en Alemania. Esto vino a través de la traducción y publicación en 1903 de su libro "Algunos aspectos del primer sentido del yo", que apareció en los Estados Unidos en 1898.

Fue el trabajo de Oswald Kroh (1887-1955) que obtuvo una recepción excelente para el libro de Hall. Como psicólogo, estaba ansioso por descubrir formas fructíferas de implementar los nuevos hallazgos en la educación. En esto, su preocupación particular fueron las fases de desarrollo, y cómo la metodología de enseñanza podía beneficiarse del conocimiento de ellas. También fue Kroh quien buscó identificar el momento decisivo en la recapitulación postulada por Hall: la primera conmoción del sentido del yo en el niño de dos a tres años que se caracteriza, por una parte, por la primera referencia del niño a él mismo como "yo" y, por otro, con la "fase obstinada" asociada con el primer distanciamiento del niño de su entorno. Según Kroh, este evento se repite en forma modificada en la transición de la segunda a la tercera fase de la edad escolar (Kroh 1928, p. 93). El niño de siete años, recién ingresado a la escuela, expresa en la primera fase un realismo coloreado por la fantasía y una disponibilidad para la analogía. Alrededor de los 10 años -la segunda fase- el niño llega a una actitud más plenamente consciente (ingenuo realismo), fase que se caracteriza por el desarrollo de una actitud crítica, combinada con todos los signos de un segundo "período obstinado". Kroh designa este punto en desarrollo con el término "realismo crítico inmaduro" (Kroh 1928, p. 100, Bergius 1959, p. 138, Trautner 1997, p. 34). Al mismo tiempo, en el transcurso de este segundo período obstinado, el niño de 10 a 12 años (la edad exacta depende del individuo) "se vuelve hacia adentro" (Bergius 1959, p. 138).

Así a comienzos del siglo XX, la psicología del desarrollo ya había producido un modelo de fases detallado basado firmemente en evidencia empírica y no, como era tradicionalmente el caso, en descripciones idealizadas de pasos fijos. Ahora se habla de momentos sutiles de desapego incipiente, que ocurren antes del inicio de la pubertad, que pueden describirse como fenómenos transicionales. Repetidamente, Kroh hace una mención especial con respecto a los niños de diez años: "De la mano con la actitud crítica de este grupo

de edad, que no se inmuta ante lo que un maestro puede hacer o decir en clase, está el hecho de que el niño de diez años cada vez más se aleja de lo que está inmediatamente delante de él, prestando más atención a las relaciones detrás de los fenómenos dados. Entonces se puede decir que ahora no son tanto las cosas mismas, sino las relaciones entre ellas las que tienen su interés" (Kroh 1928, p. 100). Y en la misma página, Kroh afirma, "Consciente de su propio valor, el niño de 10 a 12 años muestra una capacidad bien desarrollada para evaluar no sólo dónde se ubican él y sus compañeros en la escala de valores, sino también las deficiencias ajustadas o reales de los adultos" (Kroh 1928).

El concepto de la "segunda fase obstinada" debe ser visto dentro de la historia del concepto "rubicón". Aquí de hecho hay una conexión factual y estructural. Sin embargo, en lo que respecta a la segunda fase obstinada, la literatura científica le asigna autoría exclusiva a Kroh (véase Oerter & Montada 2008; Cizek et al., 2005; Steinebach 2000; Trautner 1997; Bergius 1959). La carrera científica de Kroh comenzó en 1926 con su primera publicación, "Las fases del desarrollo en la infancia media" (Kroh 1926). En este momento temprano de su carrera ya tenía la intención de aplicar el modelo de fase para el beneficio de la educación. La primera gran monografía sobre el tema – "Psychologie des Grundschulalters" (La psicología de los niños en edad de escuela primaria - el trabajo citado aquí) no apareció hasta 1928. Steiner murió en 1925 y no pudo haber tenido la oportunidad para absorber el contenido de esta teoría psicológica recién formada, cuyos comienzos probablemente conocía a través de Hall. Por lo tanto, contrariamente a los supuestos especulativos de Prange y Zander, podemos excluir la posibilidad de que Steiner derive el concepto de rubicón de la segunda fase obstinada.

El desarrollo del niño de acuerdo con la ciencia espiritual

Implícitamente, el término Rubicón de Steiner ya pertenecía a su teoría del desarrollo que incluía la concepción por fases. En 1907 Steiner dio una clara indicación de que la ciencia espiritual sería capaz de generar un sistema de práctica educativa (véase Loebell, 2016). Al hacerlo, tendría por un lado que responder a las preguntas planteadas por el impulso de renovación que emana de la ciencia moderna. Por otro lado, Steiner sostuvo que muchas de las sugerencias de reforma que se estaban difundiendo en el extranjero en relación con una amplia variedad de áreas de la vida y el conocimiento seguían siendo superficiales, debido, entre otras cosas, al predominio de los modos de pensar materialistas. Esto fue igualmente cierto sobre los esfuerzos de reforma en todo el ámbito de la educación. Los orígenes de este modo de interpretación materialista se basan, según Steiner, en el principio de que la observación por medio de los sentidos es la única fuente de conocimiento confiable y verificable (Steiner 1992, p. 10). Dentro del contexto de esta crítica podemos acomodar fácilmente todas las formas posibles de extender la percepción humana por medio de instrumentos de medición y observación. El objetivo de Steiner, sin embargo, no es principalmente los métodos de observación y los datos que entregan, ya que estos sin duda revelan aspectos del objeto de estudio (en este caso, el ser humano). Por el contrario, la característica clave del estilo de interpretación materialista es, según él, el veredicto de que todas las propiedades estructurales de un organismo vivo son, en principio, explicables como componentes materiales. En otras palabras, la apariencia, la estructura, el acceso y la explicación permanecen en el mismo nivel ontológico (material)[3]. También los cambios en el curso de la ontogenia de un organismo son, en consecuencia, los efectos que surgen de la interacción de las fuerzas puramente perceptibles por los sentidos. En contraposición a esto, Steiner, al describir el desarrollo humano, habla de una entidad cuádruple que se manifiesta gradualmente en el tiempo, cambiando en el proceso y adquiriendo así la posibilidad de desarrollar individualidad (identidad personal centrada en un "yo" individual).

A. El cuerpo físico existe completamente en armonía con las leyes físicas y bioquímicas en la medida en que estos componentes materiales están presentes en él. Esta dimensión de su existencia se comparte con los grandes reinos de la naturaleza inorgánica.

3. Tal concepción de la ciencia puede designarse como "naturalismo ontológico" (Ziegler 2014, p. 9). En su apelación rígidamente exclusiva a la materialidad, este se distingue del "naturalismo metodológico" (Ziegler 2014, p. 10) que aunque favorece el método empírico, no excluye en principio ninguna dimensión de la realidad. El naturalismo metodológico generalmente procede sobre la base de un realismo hipotético y la asunción de un mundo legalmente estructurado (ibíd.).

B. De acuerdo con Steiner, sin embargo, los efectos mutuos coherentes, la organización viviente de las sustancias del cuerpo, no pueden explicarse sólo por su fisicalidad, en otras palabras, "desde abajo". A este principio de forma que funciona como un poder moldeador, Steiner le asigna una dinámica ontológica propia, denominándolo "etérico". El cuerpo etérico o cuerpo de vida es la influencia formativa que armoniza los procesos físicos y asegura la unidad de la función orgánica. Este nivel que el ser humano tiene en común con las plantas y los animales, también tiene cuerpos vivos que se desarrollan en el tiempo y el espacio.

C. Como tercer miembro de la totalidad que es el ser humano, Steiner habla del cuerpo afectivo o astral como la esencia del sentimiento-vida. Funcionalmente, éste es también el territorio de origen de los animales. En esta área de conciencia aparecen los fenómenos de sensación, placer, alegría, dolor, deseo e impulso (Steiner, p. 13, citado por Heusser 2007, p. 169). Esta lista señala cuáles son principalmente las necesidades, los estados y los objetivos implícitos que conducen a la supervivencia (Wandschneider 2014, p. 178). Es un reino de sentimientos cualitativamente descriptible que todavía no es capaz de aprehenderse. Se agota en los contenidos de sus propios estados mentales.

D. Finalmente, con el "yo" Steiner designa una característica integral a la naturaleza humana que no compartimos con ninguna otra forma de vida. El "yo" o "yo mismo", como asiento del pensamiento consciente, es espíritu o "el aspecto espiritual del alma" (Tomás de Aquino, véase Beck, p. 138) y crea la unidad de la conciencia. En esta área, sin embargo, los seres humanos difieren significativamente unos de otros. Si bien cualquier adulto sano puede usar la denominación "yo", el funcionamiento de éste "yo" es muy individualizado. Los poderes del pensamiento y de la transformación personal dependen por completo de la iniciativa individual. Es preeminente en la forma en que se desarrolla a través del pensamiento que revela la estructura del ser consciente (Steiner, p. 16). En el proceso de pensar, el ser humano construye el orden conceptual a la luz del cual interpreta los fenómenos del mundo y de su propia existencia.

Cada uno de estos cuatro niveles estructurales del ser humano requiere su propia forma de descripción. Una implicación principal de esto es que un modo de conciencia "superior" sólo puede expresarse en virtud de su descanso en un nivel "inferior". Por ejemplo, si alguien es capaz de distinguir los gustos de los diferentes tipos de café, entonces tiene la posibilidad de hacer una elección, y luego de convertir una intención en acción (un acto volitivo). Aquí la percepción precede al acto de la voluntad, pero esta última no es causada por la percepción (es posible percibir cualquier cantidad de objetos subjetivamente interesantes sin que esto lleve a ninguna acción posterior). El acto de voluntad es, por lo tanto, un proceso interno único en sí mismo, y debe investigarse en los términos específicos y particulares (Heusser 2007, p. 170). Lo mismo ocurre con los otros niveles: El organismo vivo (físico-etérico), la organización psíquica (astral) y el "yo" (noético) dependen cada uno de algo "por debajo" de ellos, pero sobre esta base determinan la forma de su propio ser.

El enfoque didáctico de la obra pedagógica de Steiner "La educación del niño desde el punto de vista de la ciencia espiritual" publicado en 1907 se deriva de los procesos de desarrollo a los que están sujetos los cuatro niveles descritos anteriormente (Steiner 1992). Aquí se encuentran dos factores: el despliegue endógeno del individuo y la influencia formativa de cuidadores y educadores que trabajan desde el exterior (influencia exógena). Las dinámicas endógenas están organizadas, según Steiner, en un ritmo de siete años, aunque esto es descrito como un ideal esquemático que está sujeto a una considerable variación individual. Dentro del período de desarrollo hasta la edad adulta, se dice que el tejido espiritual interior del ser humano experimenta tres "nacimientos" en intervalos de siete años: el período desde el nacimiento físico hasta la preparación para la escuela está dedicado a la estructuración del organismo, incluyendo sistema sensorial, desarrollo cerebral, coordinación del movimiento. En esta etapa, el cuerpo etérico todavía está estrechamente ligado al cuerpo físico y, por lo tanto, es el motor principal de este proceso de transformación. Alrededor de los siete años de edad, la organización del cuerpo etérico experimenta un cambio importante, el signo exterior visible es el cambio de dientes. El cuerpo etérico ya no está tan estrechamente ligado al cuerpo físico; se vuelve libre, y se dice que está a disposición del poder de cognición del despertar del niño. Hasta la edad escolar los niños aprenden principalmente mediante un proceso de identificación participativa ("imitación"), y posteriormente, en el siguiente nivel, ellos tienen la necesidad de encontrar en el mundo adulto a alguien que sea una auténtica representación del orden. La autoridad de los adultos ya no es simplemente aceptada.

Los niños de escuela primaria cada vez juzgan más a sus compañeros más grandes y amplían los límites en consecuencia. Alrededor de los 14 años, según este modelo, el joven entra en la pubertad. Steiner coloca en la agitación interna de esta fase la puerta del cuerpo astral, que se vuelve libre ("nace") en este momento y es el vehículo de la conciencia emocional. Y finalmente, alrededor de los 21 años, nace la plena individualidad (el "yo"). Con las capacidades de pensamiento y voluntad que ahora se han desarrollado, el joven tiene la capacidad de navegar su propia biografía.

El segundo factor de enfoque para Steiner es el efecto modulador sobre los procesos de desarrollo endógenos por parte de los encargados de cuidar y educar a los niños. En consecuencia, el papel pedagógico del educador se describe como complementario: Los enormes cambios que tienen lugar en el comportamiento general de los niños pequeños desde la infancia hasta la edad de la escuela primaria deben ser tratados por cuidadores-educadores de tal manera que los impulsos biofísicos emergentes que ellos representan puedan llegar a una expresión completa. Por supuesto, el otro aspecto es proteger a los niños de estímulos e influencias que aún no podrían enfrentar:

> "Así como las influencias del mundo externo no deben ejercerse sobre el niño que aún no ha nacido, tampoco el cuerpo etérico debería exponerse a esas influencias que son equivalentes para el cuerpo físico antes del cambio de dientes. No se debe permitir que las influencias correspondientes entren en juego sólo hasta después de la pubertad." (Steiner 1992, p. 202)

Además de éstos dos principios pedagógicos de la actitud de apoyo hacia todo lo que surge en el desarrollo mental y físico del niño y la protección contra influencias inapropiadas, Steiner produjo una gran cantidad de ideas educativas a partir de 1919 (véase Selg 2011; Ruef 2012). Si esta función protectora prevista se transpone al contexto de la teoría educativa moderna, puede decirse que la persona responsable de este proceso tiene "una tarea tanto terapéutica como profiláctica" (Oevermann 1996b, p. 158). De acuerdo con esta visión de la educación, las crisis que inevitablemente surgen durante los procesos de desarrollo y socialización deben satisfacerse con una comprensión bien informada y, cuando sea necesario, deben ser solucionadas.

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El rubicón como un fenómeno de desarrollo en la infancia media[1]

(Segunda parte)

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El Rubicón como momento decisivo en el segundo septenio

El ensayo de Steiner "La educación del niño..." se puede considerar con seguridad como el primer paso en su presentación del desarrollo humano en términos de ciencia espiritual, aunque sólo cubre el período desde el nacimiento hasta la adolescencia. Al mismo tiempo, no es un ejemplo de "investigación" en la ciencia espiritual, ni puede pretender ser de cualquier manera comprehensiva. El ensayo se considera mejor como una representación de un conjunto de fenómenos que normalmente se interpretan de manera diferente, pero que producen ecos biográficos en la memoria del lector. En su enfoque para explicar el desarrollo humano, Steiner hace referencia a patrones de fuerzas que, aunque tienen efectos espacio-temporales, son de origen no material y muy sensible. Steiner no puede ofrecer ninguna "prueba", sino razones para considerarlos como plausibles. Por ello, el método que él defiende no se basa en la gracia, sino en principio, defiende la posibilidad de una comprensión directa, lo cual también es empírico.

En el curso de las fases de desarrollo, con sus tres nacimientos "espirituales", ocurre, en medio del segundo septenio, un momento que se destaca. Steiner estipula este tiempo de diferentes maneras. Principalmente, habla de lo que ocurre a la edad de nueve o diez años, pero hay muchos otros casos en los que parece estar pensando más en un período que puede extenderse fácilmente hasta la edad de once años (Selg 2011, p. 17). Tampoco él excluye la posibilidad de que el Rubicón pueda comenzar a la edad de ocho años[2].

Sobre el trasfondo del nacimiento del cuerpo etérico y la incipiente diferenciación de las funciones mentales que esto conlleva, el evento central del que se ocupa Steiner se puede caracterizar de tres maneras diferentes: 1) como el primer brote de la autoconciencia, que es también la recurrencia, en una forma más espiritual, de la primera expresión de la individualidad a la edad de dos o tres años (Steiner

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2. "Muchos niños llegan a este punto antes de los nueve años, mientras que otros lo hacen más tarde, pero en promedio, lo que hoy les voy a contar comienza a los nueve años" (Steiner 1990, p. 96). La cita expresa claramente el hecho de que la edad más frecuentemente mencionada de nueve o diez años es un valor promedio, y por lo tanto no debe establecerse dogmáticamente.

1994, p. 128; Ruef 2012, p. 16); 2) como una reestructuración de la relación con el mundo social y con el mundo de los objetos; y 3) fisiológicamente hablando, como la organización del llamado sistema rítmico ("madurez respiratoria").

A continuación estas tres perspectivas fundamentales, a las que Steiner hace referencia continuamente, serán el enfoque principal. Steiner evidentemente concibe el Rubicón como una crisis normal del desarrollo[3]. El marco del evento es la experiencia personal del despertar de la individualidad. Müller-Wiedemann ha descrito esto como "la manifestación de la actividad del ser entre la infancia y la juventud – el momento en que, por primera vez, la vida y el sentir del niño se desarrollan como una fuente de experiencia auto-motivada" (Müller-Wiedemann 1999, p. 31). Adicional a ello, el niño toma conciencia de la forma en que la relación con el mundo fue experimentada en la primera fase de los siete años. Al mismo tiempo, a modo de contraste, ahora nace la conciencia de una forma mucho más desapegada de la existencia. Esta combinación de conciencia difusa del pasado y una sensación más clara del ser como un yo individual e independiente lleva al niño a cuestionar su propia existencia. Antes, ni el propio pasado del niño ni el futuro eran un problema. Según Müller-Wiedemann (1999), este proceso sucede aproximadamente entre las edades de nueve y doce años.

Al mismo tiempo, en lo que respecta a la calidad de la relación del niño con el mundo, este evento se asocia con una disminución de la capacidad de identificación participativa ("imitación") mediante la cual el niño estaba "vinculado" a procesos de aprendizaje no conceptuales en la primera fase de los siete años. Este instinto para la identificación participativa está, por lo tanto, incrustado en una especie de simbiosis entre el bebé y su cuidador. Con el debilitamiento de esta capacidad se produce un cambio inevitable en la estructura de las relaciones del niño. En lugar de identificarse con el mundo a través de un principio de participación y tener una relación simbiótica con los maestros y los padres, nuevas estructuras se deben construir. El resultado ideal aquí sería un aumento de la autonomía y una expansión concomitante de la esfera de la vida. En palabras de Steiner:

> "Los efectos secundarios de la capacidad de identificación participativa desaparecen gradualmente, y entonces algo entra en juego que... se puede observar fácilmente: Allí surge para el niño una relación especial con su propio ser". (Steiner 1998, p. 172)

Otro cambio que se produce es en la imagen que el niño tiene de sus padres o maestros –quienes ya no tienen un estado incuestionable. La autoridad natural que era una cualidad inherente de esta relación de vida se rompe ante este cambio en el mundo interior del niño. Si lo que contaba para el niño era: "... hay una figura de la autoridad que me revela el mundo. Miro el cosmos a través de esta persona" (Steiner 1979, p. 45), ahora lo que tenemos es: "¿Es esta figura de autoridad la correcta? ¿Esta persona me está dando una imagen real del mundo?" (Steiner, ibíd.) "un fortalecimiento considerable (...), una concentración del sentimiento de identidad" (Steiner 1980, p. 16), un nuevo "tipo de autoconciencia" (Steiner 1994, p. 128) o un "sentido de conciencia de sí mismo" (Selg 2011, p. 21). Todo esto, por supuesto, también reconfigura las relaciones en un sentido externo. El mundo del Tú: "el Otro como otro, en contraste con lo que es propio, comienza a ocupar al niño por primera vez"[4]. (Selg 2011, p. 27).

Naturalmente, esto también incluye un cambio fundamental en la relación del niño con el mundo de los objetos, como se describe aquí:

3. Steiner a menudo usa la expresión "crisis" o "momento de crisis" para caracterizar el Rubicón; por ejemplo, Steiner 1981, p. 41. En otro contexto, Steiner habla de "transición/transiciones biográfica/s, metamorfosis, que ocurren como resultado del cambio de dientes o un inicio tardío a la pubertad (véase Steiner 1981, p. 41, también Selg 2011, p. 35). Designamos la comprensión de Steiner de la crisis como "normal", porque evidentemente la concibe como parte integral del proceso de ontogénesis. Lo que tenemos aquí son términos generales, que por lo tanto conservan su validez incluso cuando la experiencia subjetiva del niño está ausente o débil.

4. Aquí debe señalarse que Steiner sólo considera el cambio de relación Yo-Tú en términos de niño-adulto. Esto, sin embargo, es una vista demasiado limitada. Los estudios actuales sobre la infancia media también tienen en cuenta las relaciones entre compañeros de 6 a 12 años como un elemento relevante de la socialización por encima de sus aspectos asimétricos. "Porque los compañeros no son como los padres, quienes simplemente están ahí de manera natural. Lo que vemos entre compañeros son relaciones elegidas libremente por ambas partes y abandonadas en cualquier momento en que haya insatisfacción o conflicto. Por lo tanto, estas relaciones constituyen un desafío. Los niños deben negociar independientemente las reglas de la interacción interpersonal, representar sus propios intereses, y también deben percibir y hacer concesiones a los deseos de sus compañeros" (Traub 2006, p.198).

> "En este momento, alrededor de la edad de nueve años, cuando el yo despierta, el ser humano se separa de su entorno natural, y ahora está en camino de poder hacer comparaciones objetivas entre los fenómenos naturales". (Steiner 1998, p. 173)

Para Steiner, este es el punto de partida para una amplia gama de ideas de enseñanza, que a su vez encontraron su camino hacia la práctica de la escuela Waldorf. Aquí podríamos decir que esto representa un experimento que implica tomar un momento de desarrollo concebido en términos de ciencia espiritual e implementar sus implicaciones en un contexto educativo práctico – un motivo clásico de la psicología educativa (véase Krapp, Prenzel & Weidenmann 2006, p. 5). Así, el concepto Rubicón de Steiner marca un límite o umbral: El método de enseñanza antes de que el Rubicón esté en sintonía con la experiencia de unidad del niño (identificación participativa con los mundos, tanto social y natural). La narrativa pictórica emitida por el profesor en una voz impregnada de sentimientos será propicia para esto. Después del cambio, se abre la posibilidad de abordar los mundos animal y vegetal, las matemáticas, los idiomas, etc., utilizando nuevos conceptos y métodos de presentación en el proceso.

Por lo tanto, la práctica en el aula encaja con las facultades cognitivas que emergen en el niño, y entre ellas destaca la capacidad, en asociación con la orientación pedagógica, para formar conceptos. Esto se puede ver de manera similar a la teoría genética del conocimiento de Piaget y a su teorema de las fases operativas concretas en la infancia media (desde los 8 a los 12 años de edad): La consistencia, la capacidad de comparar objetos y comprender su apariencia variable ya no están, a partir de esta edad, tan fuertemente ligadas a los fenómenos sensoriales concretos. Más bien, el niño ahora es capaz de relacionarse más directamente con criterios conceptuales (incluso si a menudo es incapaz de expresar esto en lenguaje) (Piaget 1973, p. 38). En el contexto social, esta mayor flexibilidad interna afecta notablemente el grado en que el niño es capaz de distinguir diferentes perspectivas. Al comenzar la escuela, el niño está en posición de imaginar lo que las personas piensan de cada uno o del otro. También es capaz de "relacionar la perspectiva de una persona con la de otra en coordinación secuencial; por ejemplo, al padre le gustaría ir a caminar con el niño, porque el niño lo disfruta" (Bischof-Köhler 2011, p. 346). Sin embargo, antes de la edad de diez años la percepción simultánea de perspectivas interactivas no es posible. Esto significa que luego el niño puede percibir lo que alguien piensa sobre algo y, a partir de eso, extrapolar y, cuando sea necesario, evaluar, las opiniones de los demás involucrados (Selman 1984; Bischof-Köhler 2011).

Los cambios por los que pasa el niño con el Rubicón, según lo presentado por Steiner, se dividen en dos categorías principales de observación: a) El comportamiento del niño en relación con el mundo social, y b) en relación con el mundo de los objetos, este último, por supuesto, incluye tanto la relación concreta actual como la representación mental del objeto. Los niños darán nuevos significados a los objetos que durante mucho tiempo han tenido un papel establecido en su imagen del mundo; por ejemplo, liberándolos de contextos mágicos[5]. Y para Steiner, por supuesto, la nueva relación con el Ser debe ser reconocida como el agente de este proceso de reestructuración. El sentimiento profundo del Ser es el iniciador de estos cambios. Steiner coloca este proceso en relación con los cambios en la estructura fisiológica.

Según la descripción del desarrollo de Steiner, los primeros siete años están dominados por la escultura interna del organismo. Los movimientos formativos de lo etérico (en esta etapa todavía unidos al cuerpo físico) provocan la maduración de la organización sensorial. El niño se desarrolla a través de experiencias sensoriales de todo tipo junto con los contextos emocionales en los que están involucrados (relación niño-padre). Para Piaget, esta es la fase del desarrollo sensoriomotriz (Piaget 1973, p. 102). Con el inicio del segundo septenio y la liberación del cuerpo etérico, el desarrollo formativo y la sincronización de los procesos rítmicos entran ahora cada vez más en juego en el organismo. Selg, quien es médico, resume la perspectiva de Steiner de la siguiente manera:

> "Para tomar su lugar legítimo en el centro de todos los procesos de la vida orgánica, el sistema rítmico; es decir, la interacción mutua entre la respiración y la circulación sanguínea mediada por el corazón, debe estar en equilibrio entre sí. Debido al predominio general de la organización de la cabeza (en otras palabras, el sistema

5. La mentalidad animista (mágica) atribuye motivos o intenciones a objetos no vivos en una secuencia de eventos. Esta tendencia puede persistir hasta la edad escolar, pero luego es reemplazada relativamente rápidamente por un concepto de causalidad (véase Bischof-Köhler 2011, p. 348).

> neuro-sensorial), hasta la mitad de los procesos respiratorios infantiles (...) se superan los ritmos de la circulación sanguínea en su importancia funcional y fuerza. Sin embargo, eventualmente, se acomodan a la circulación sanguínea (...), y esto conduce a encontrar un equilibrio individual" (Selg 2011, p. 40).

Aun así, este logro de la coordinación, el equilibrio fisiológico entre las frecuencias de la respiración y los latidos del corazón (en el adulto, esta relación se asienta más o menos a las dieciocho respiraciones por cada setenta y dos latidos del corazón), no sólo sucede armoniosamente por sí mismo. Para Steiner, esto representa una crisis fisiológica, una "lucha dentro del organismo" (Steiner 1989, p. 110) [6]que debe considerarse como la "correlación física" del período de transición espiritual y, como tal, que requiere atención pedagógica especial (Steiner 1989, p. 110). En general, sin embargo, él considera el "sistema rítmico", durante la fase de siete a catorce, como una unidad funcional de desarrollo, que brinda al niño nuevas posibilidades de expresión, y que debería abordarse pedagógicamente, en particular mediante la música, el movimiento y la oralidad (Steiner 1987, p. 159).

Además de las sugerencias sobre el método y el contenido de la enseñanza, Steiner señala la necesidad primordial de que los adultos en puestos de responsabilidad examinen su actitud hacia el niño de nueve o diez años. La naturaleza de la autoridad del adulto debe ajustarse de manera que corresponda al cambio de conciencia que se produce en el niño. Esta es una cuestión de la disolución gradual de la relación unilateral que ha existido desde el nacimiento del niño. En este estado de asimetría (en la relación de padre a hijo), la capacidad del niño para la identificación participativa le permitió aceptabilidad. Experimentó un orden universalmente válido como autoridad inherente a la calidad de la relación en sí. La emancipación de este orden también hace que las figuras de autoridad aparezcan bajo una luz diferente. Los impulsos internos liberados del alma del niño lo obligan a cuestionarse si el orden representado por la autoridad paternal está auténticamente a la altura o no. En este estado crítico, el niño puede encontrar un apoyo interno si los responsables de su bienestar son capaces de hacerle consciente de un orden superior a través de su propio comportamiento. La manera en que el adulto se comunica con el niño puede adoptar más el tono de un representante. En forma, contenido y autenticidad personal, este nuevo estilo, a su vez, apuntará a algo más allá de sí mismo: Un mundo de nobleza, de cimientos firmes. Steiner ha expresado esta noción cuasi-religiosa tan concretamente como podría desearse:

> "(...) en la fase de la vida entre las edades de nueve y diez años, cuando el niño adquiere la capacidad de distinguirse claramente del mundo, es esencial, en el interés de toda la vida moral futura de la humanidad, que tenga alguien a quien puede admirar con el mayor respeto, alguien en el papel de maestro, a quien él venere como una autoridad." (Steiner 1998, p. 264)

Y luego un poco más adelante:

> "La educación moral y religiosa se basa completamente en la experiencia de veneración del niño, en el punto clave de la vida alrededor de los nueve o diez años de edad." (Steiner ibíd. p. 264)

Aquí no se trata de quién es el modelo a seguir, y menos aún, como podría objetarse, de suprimir los derechos del niño estableciendo un espíritu de obediencia no crítica. Todo lo que pretende Steiner es que

6. En un estudio realizado por Breithaupt, Bestehorn, Zerm y Hildebrandt (1980), se determinó la proporción de respiración entre los latidos del corazón en 47 niños internados de seis a trece años de edad y se comparó con la de un grupo de 50 adultos. Los resultados se pueden resumir de la siguiente manera: "En los niños también se encontró un buen grado de coordinación de frecuencias, como se observó en los adultos. Sin embargo, no mostraron una norma supraindividual. Lo que fue especialmente notable fue la ausencia de la proporción adulta normalmente esperada de 4:1. Los hallazgos apuntan mucho más a un amplio espectro de proporciones de números enteros preferidos, aunque ciertas diferencias parecen estar asociadas con diferentes momentos del día y diferentes grupos de edad. Particularmente llamativo aquí son los valores medios más altos obtenidos durante la fase de sueño (trofotrópico) en oposición a la fase de vigilia (ergotrófico). Debido a la falta de cualquier proporción supraindividual que pueda describirse como la norma dentro de este rango de edades, no existe la posibilidad de aplicar un concepto unificado de lo que es normal para este grupo de edad, aunque en ciertas edades una intensificación de la coordinación durante la fase de sueño (trofotrópica) fue observable" (ibíd. p. 405). Un estudio realizado por Cysarz et al. (2011) logró mostrar los factores que afectan la frecuencia cardíaca promedio a lo largo del desarrollo del niño: "En niños pequeños, se encuentra alrededor de 100 latidos por minuto, a la edad de 10 años aproximadamente 90 latidos por minuto. El ritmo cardíaco cambia de manera correspondiente. En niños pequeños, el ritmo es más estático, ya que la frecuencia más alta restringe el ritmo. A partir de los 10 años, las cualidades de los ritmos de los latidos del corazón son comparables a las de un adulto" (Cysarz 2008, p. 3; para obtener más detalles consulte Cysarz et al. 2011).

la autoridad pedagógica del maestro deba incluir una cualidad trascendente y presente[7], que se ilumina en la conciencia interna del niño. Sólo después de la adolescencia, él podrá someter el principio involucrado al reconocimiento intelectual[8]. La experiencia del niño debe ser que "lo divino viva en la naturaleza, al igual que en todo el desarrollo humano...", como un factor estabilizador y punto de orientación durante esta crisis de identidad para que la "figura de autoridad" se convierta en el mediador entre la subjetividad del niño y un nivel superior de la realidad. Más adelante en la vida, cuando el niño haya alcanzado la mayoría de edad, podrá determinar su propia acción a este nivel superior[9].

Aquí, por supuesto, queda claro hasta dónde llega la definición de Steiner con respecto a la tarea del maestro, ya que abarca tanto la impartición de valores en general como la provisión de una red de seguridad para la crisis de desarrollo de la infancia media. Esta gran demanda y la idea de autoridad carismática que se desprende de ella ha sido destacada por el comentario crítico de Helsper (2007). Él siente que la tradición ininterrumpida de autoridad pedagógica (que aún es fuerte dentro de la educación de Waldorf) va en contra de las tendencias sociales modernas, reduciéndose a lo que es básicamente un "reflejo de la de-modernización" (Helsper 2007, p. 74).

El Rubicón y la tipología de crisis de Oevermann

Hay una rama de la investigación sociológica moderna que parece ser adecuada para llevar nuestro examen del Rubicón a una etapa superior. En particular, proporciona un nuevo marco conceptual para el enfoque pedagógico-terapéutico de Steiner que resuelve el problema de autoridad asociado con el Rubicón. Con este fin, presentaremos a continuación un bosquejo de la teoría de los tipos de crisis según Oevermann, que incluye formulaciones de estrategias que las personas utilizan para superar crisis de varios tipos. Una presentación detallada del enfoque teórico de Oevermann está contenida en Wagner (2004a, 2004b, 2001). Para tal fin, tomamos nuestro liderazgo en esto.

Oevermann identifica tres tipos de crisis estructurales que los individuos pueden encontrar en sí mismos. Los métodos para aliviar, mejorar o superar completamente cada tipo son igualmente distintos entre sí. La tipología es la siguiente:

1. La crisis como una confrontación con hechos inesperados (brute facts). La crisis traumática (Wagner 2004b, p. 38)
2. La crisis de decisión
3. La crisis no forzada

7. Esta forma de pensar, que establece ciertas formas de acción humana en relación con los niveles trascendentes de la realidad y formula sus implicaciones pedagógicas mutuas, existe en otras culturas, por ejemplo en la cultura china: "A través de lo que es verdadero y auténtico [en la acción humana] lo Divino, lo trascendente se antropomorfiza. A través de esta manifestación ontológica, el cielo se acerca a la tierra y, por un lado, otorga una forma antropomórfica a la inmanente manifestación de la trascendencia, que otorga al ser humano conciencia de sus sentimientos y experiencia de vida, y por el otro, ofrece un modelo comprensible para las insinuaciones cotidianas de la trascendencia del ser humano, de las cuales surge una base implícita para la moralidad..." (Yang 2004 p. 114).

8, Las declaraciones de Steiner sobre la autoridad en un contexto educativo indican claramente que utiliza el concepto en un sentido dinámico. Un punto de partida para una actitud apropiadamente equilibrada hacia la autoridad la obtiene de su análisis de la relación niño-adulto. Este proceso está sujeto a cambios cualitativos porque el niño está en camino de convertirse en un individuo auto-determinante. Por lo tanto, la relación con la autoridad está sujeta a cambios. Un enfoque autoritario de la educación no tomaría en cuenta estas dinámicas. El concepto de autoridad explícitamente no estático de Steiner tiene un parentesco con un teorema actualmente defendido por algunos académicos de la educación. Este es el teorema de la autoridad de interacción (también conocido como autoridad pedagógica), que presupone un principio de reconocimiento. Este reconocimiento de la figura de autoridad está directamente relacionado con la competencia percibida de esa figura en una variedad de situaciones de la vida ("autoridad epistémica" según Bochenski 1974). Esto significa que "(...) la autoridad real dura sólo mientras subsista una relación de este tipo entre el reconocedor y el reconocido. Tan pronto como uno de los miembros disuelve este acuerdo interactivo, la relación de autoridad también llega a su fin" (Latzko 2012, p. 578).

9. Para Hegel, también esta relación culmina en un concepto de autoridad: "La contingencia de la cual surge una necesidad, lo efímero del ser humano y la conciencia de lo eterno, la relación entre el sentimiento, pensamiento y acción, desde una perspectiva general, se llama autoridad." (Hegel 1983, p. 223)

Tipo 1: *La crisis traumática*. De acuerdo con este tipo de crisis, una persona encuentra su forma de vida de repente confrontada por algún evento externo o interno de tal manera que su rutina normal no se puede mantener. Es imposible no reaccionar a esta clase de eventos (Wagner ibíd. p. 38). La intensidad de una crisis como esta, que conlleva estrés mental y corporal, es o puede ser traumática en su efecto. La persona afectada sólo podrá contrarrestar este efecto mediante un esfuerzo interno considerable y/o mediante el apoyo de otros.

Tipo 2: *La crisis de decisión*. Este tipo de crisis surge a través del intento del individuo de lidiar con una variedad de opciones, las cuales tienen implicaciones prácticas inevitables. Dado que la conducta de la vida diaria involucra nuestra razón al cuestionamiento de la ejecución, la evaluación o la evitación de cursos de acción que compitan objetivamente, el individuo está constantemente bajo presión para tomar decisiones. Entre estos se encuentran algunos con implicaciones desconocidas para el futuro. Estas son decisiones de gran trascendencia, porque establecen un punto de no retorno con consecuencias a largo plazo, como, por ejemplo, la decisión de casarse o tener un hijo. Aquí también se aplica el principio de que uno puede llegar a no decidir (Wagner ibíd. p. 39).

Tipo 3: *La crisis no forzada*. Esto surge dentro del alcance individual de la libertad de acción y, según Oevermann, puede considerarse análogo a la experiencia estética. Este tipo de crisis implica, por ejemplo, asumir un nuevo desafío de algún tipo, independientemente de sus consecuencias imprevisibles. Un ejemplo de esto podría ser renunciar a un trabajo seguro para asumir una nueva tarea profesional que, aunque difícil, está llena de potencial. Sólo en retrospectiva, la persona que toma tal acción puede evaluar si la decisión no forzada de aceptar el desafío valió o no la pena. Aquí lo que está en juego es la conciencia intensa de una posibilidad recientemente encontrada, que uno decide seguir, a pesar del alto riesgo involucrado. Debido a la inusual intensidad perceptiva involucrada aquí, tal momento de apertura puede considerarse como comparable a una experiencia aestética (Oevermann 1996a, p. 46; Wagner 2004b, p. 40).

El curso del crecimiento y desarrollo está marcado por una serie de eventos que se originan en el cuerpo, a la vez que están estrechamente vinculados con la experiencia acumulada individual de aquellos responsables de su bienestar. Vivir estas experiencias en última instancia produce un cambio tanto en la relación con uno mismo como con el mundo en general, y esto a su vez abre nuevas vías de acción. Sin embargo, como regla general, tales posibilidades sólo se abren cuando el individuo abandona las estructuras de apoyo a las que solía estar acostumbrado. Junto con esta disolución gradual de los lazos antiguos, se presenta la oportunidad de dar ciertos pasos en el camino hacia la identidad personal. En la medida en que estas experiencias críticas representan estaciones esenciales en el desarrollo individual, en otras palabras, son parte integral de todo el proceso de ontogénesis física y mental, podemos hablar razonablemente de "crisis emancipadoras ontogenéticas" (Wagner 2004b, p. 368). Las diversas escuelas de psicología difieren en su interpretación de estos fenómenos, pero el hecho de que tenga sentido hablar de tales procesos de separación que ocurren en el curso del desarrollo no está en discusión. Más o menos en todos los ámbitos hay consenso sobre este punto. Desde una perspectiva psicoanalítica, Oevermann define las siguientes crisis de separación: De gestación a nacimiento, la liberación de la relación simbiótica temprana entre la madre y el bebé, la crisis de Edipo, el período de latencia (escuela, infancia media) y la adolescencia. Dado que el individuo no está en posición de decidir si atraviesa estas crisis, porque surgen en la dinámica inevitable del desarrollo endógeno, éstas pertenecen al encabezamiento de la crisis traumática. El individuo no puede decidir evitar las demandas de estos procesos de emancipación gradual. Tal intento, si resultara en el fracaso de un paso emancipatorio, comprometería el desarrollo del ego. Por esta razón, la teoría de la socialización no busca formas de evitar las crisis, sino que analiza los requisitos psicológicos para hacer frente a su inevitable aparición.

Al realizar este análisis, Oevermann formula una tríada de condiciones para llegar a un acuerdo con las crisis de emancipación. En su opinión, los primeros dos factores están estrechamente relacionados con la experiencia primaria de ontogénesis y forman la base para las disposiciones mentales a largo plazo. La tríada comprende: a) *convicciones*, b) *creencia*, y c) *conocimiento*.

Las convicciones, en el sentido utilizado aquí, son hábitos profundamente anclados a nuestra experiencia de vida. Se forman a partir de la fase simbiótica temprana, es decir, están íntimamente asociadas con las

estructuras de enlace de la primera infancia, como las que existen en la díada madre-hijo. Más adelante, se trata de aspectos del "proceso de formación de la comunidad en el contexto familiar" (Wagner 2004b, p. 31) y de las experiencias que generan convicciones dentro de los grupos de características similares:

> "Todos estos lugares sucesivos en los que el desarrollo pone fin a algo, correspondiente a una etapa específica del proceso, ofrece posibilidades de experimentación y garantiza la protección. Cualquiera que haya tenido suficiente experiencia incuestionable y directa de tales transiciones tendrá convicciones internalizadas correspondientes a ellas. Estas permanecen en la historia de vida de una persona como sedimentos, que no estará dispuesta a modificar más adelante, y mucho menos a renunciar, excepto en el caso de alguna crisis extrema de cambio" (Oevermann 2000, citado en Wagner, ibíd.).

De esta manera, lo que se manifiesta en las convicciones son patrones afectivos y cognitivos, que se han originado en la experiencia primaria de las relaciones. Son viscerales y difíciles de acceder conscientemente; por lo tanto, eluden la objetivación completa. Por ejemplo, según este punto de vista, una persona que ha sido parte de una simbiosis madre-hijo exitosa (conocida en la teoría de la vinculación como "el vínculo seguro" (Grossmann & Grossmann 2009) cuando se enfrente a una crisis más adelante en la vida, se verá impulsada por la convicción de que puede recurrir a otras personas para obtener apoyo. Para que esto sea un patrón de comportamiento fácilmente repetible, debe estar profundamente anclado en la experiencia pasada de poder confiar en otras personas (Kissgen 2009, p. 98).

Mientras que las convicciones surgen de las estructuras de unión, *la creencia* es el resultado de procesos de emancipación. Es en sí mismo una crisis, y al mismo tiempo una parte importante de la solución. Así, Oevermann propone un concepto de creencia funcional, que puede interpretarse en términos específicamente religiosos, pero también en términos más generales. Después de haber pasado por una simbiosis exitosa con su madre, el niño entra en una serie de pasos emancipadores. La investigación sobre la unión muestra que la emancipación es más probable que tenga éxito cuando más confianza haya tenido la experiencia primaria (Faix 2004, p. 278). Aun así, sin embargo, es probable que el proceso esté cargado de conflictos, en parte porque el niño, al aflojarse de la esfera protectora de los padres, acumula sentimientos de culpa. Los signos de tales sentimientos de culpa pueden manifestarse a veces en un comportamiento obviamente ambivalente. Por ejemplo, en la aparición de un patrón que implica gestos de rechazo y aferramiento. *Tras disfrutar de la simbiosis temprana*, el niño experimenta las dinámicas paradójicas del enredo de la culpa como el precio de la emancipación. No es capaz de captarlo mentalmente en términos racionales, ni de controlarlo. Por eso exige resolución a través de algún tercer medio de reconciliación. Pero debido a que esto no se encuentra en su mundo, con la paradoja insoluble de dejar y conservar lo amado, lo busca en otra parte. La estructura que aquí, según Oevermann, entra en juego es la "creencia en una autoridad de orden superior, que podría ser designada como un poder espiritual supremo. Cualquiera que sea su forma y contenido concreto, la lealtad a ella trae consigo la esperanza de reconciliación y reivindicación. Esa creencia es, por lo tanto, la contraparte para la convicción, e igualmente es esencial para superar la crisis" (Oevermann 2000, citado en Wagner 2001, p. 199). Este vistazo a la sociología de la religión nos da un enfoque para ver los momentos críticos de desarrollo como fuente de transformación, y en el proceso trata a la religión en su sentido de "reencuadernación" de algo que parece perdido. Aquí es significativo que Oevermann formule el concepto de creencia de una manera neutral, es decir, sin explicarlo exclusivamente en términos de contenido religioso o de función secular[10]. Esto significa que la interpretación concreta de "espíritu", "poder" o "autoridad" es un asunto del sujeto, y seguramente también está matizada de manera decisiva por cualquier influencia biográfica que haya estado operando en el proceso de socialización.

Finalmente, llegar a un acuerdo con una crisis nunca puede tener éxito sin un depósito de *conocimiento* al que la persona pueda recurrir. Sin embargo, Oevermann no asocia el concepto de conocimiento directamente con la aparición de una crisis, como lo hace en el caso de la convicción y la creencia. Más bien, lo cambia a la esfera de la rutina (Oevermann 2000; Wagner 2001, p. 200). El conocimiento surge de la experiencia, en la medida en que, con el tiempo, produce "supuestos probados", que se establecen como dictados sociales

10. Siguiendo las ideas de Max Weber, el enfoque de Oevermann sobre la sociología de la religión vuelve a enfatizar la noción de dinámicas probatorias que conlleva toda experiencia de vida. Biográficamente los tres tipos de crisis son de enorme e inevitable importancia. El sentimiento de ser probado es el modo a través del cual un individuo trabaja en una crisis. Wohlrab-Sahr 2002, p. 20.

generalmente confiables. Ante la crisis, los individuos recurren a tal conocimiento; en otras palabras, sin recurrir a rutinas confiables, ellos no lograrían dominar la crisis, ya que cuando todos los patrones de comportamiento normalmente válidos se vuelven críticos, llega el momento de la ruptura. Aquí vale la pena señalar que la posibilidad de recurrir a la esfera del conocimiento a través de las rutinas depende en gran medida de la etapa de desarrollo de la persona, y es específica por lo tanto de la edad.

Esto hace que sea aún más significativo el hecho de que los adultos que ocupan puestos de responsabilidad con respecto a los niños pueden hacer que se sientan seguros al proporcionar "preceptos sustitutos"[11] para su orientación. Tales preceptos sustitutos representan una forma de conocimiento que no proviene de la propia experiencia del niño, sino que se deriva de otros contextos y es, por así decirlo, una autoridad pedagógica fácilmente disponible.

Si observamos la crisis en la infancia media desde estos dos enfoques interpretativos, los siguientes elementos estructurales salen a la luz:

La teoría de la estructura de socialización describe las crisis de emancipación como ontogenéticamente esencial, ya que solo la dinámica dialéctica de la simbiosis y la emancipación pueden generar la autonomía de la personalidad en desarrollo. Así, en relación con el desarrollo, todas las crisis son igualmente relevantes. La dinámica de la confiabilidad, en la que el individuo está indisolublemente ligado, es lo que permite que el desarrollo avance hacia un yo autónomo. Para la capacidad de sobrellevar las crisis, Oevermann atribuye gran importancia a la experiencia primaria de las relaciones. Si esta fue positiva durante suficiente tiempo, resulta en la convicción de que, en principio, las crisis se pueden superar. Sin embargo, el aspecto traumático estructuralmente inevitable de la crisis de identidad exige que haya algo más en juego, una autoridad que debe actuar como una fuente adicional de confianza. La creencia en algún poder trascendente puede ser mediada en forma de preceptos sustitutos por "otros significativos" o padres/figuras de responsabilidad.

Steiner, en contraste, concibe el Rubicón con todas las características enumeradas aquí, como una fase del desarrollo ontogenético, y le asigna un significado preeminente en la formación de la identidad personal. Se destaca de esta manera, en parte porque su tratamiento de la pubertad y la adolescencia fue mucho menos demarcada. Esto es algo por lo que, desde el punto de vista de la investigación moderna, él está abierto a la crítica. En cualquier caso, él considera los primeros años de vida como un período muy importante en el desarrollo del niño. Desde la experiencia de estar "envuelto" en la relación diádica, si va bien, el niño se lleva consigo la sensación de que el mundo en el que nació es verdadero, bueno y bello[12]. La tarea de criar a un niño consiste, por lo tanto, en darle una experiencia pura sin adulteraciones que lo haga sentir como en casa. La sensación de seguridad que el niño experimenta es el requisito previo para toda adquisición de conocimiento en el futuro. Para Steiner, el Rubicón es un momento pedagógico desafiante que requiere habilidades especiales. Aquí el maestro es una vez más el representante de un "orden superior". A través de la integridad de su presencia y su comportamiento, él puede ser el vehículo de una realidad trascendente que da seguridad y dirección. En contraste con Oevermann, Steiner, por supuesto, ve el aspecto religioso de esta situación en términos de realidades espirituales, en lugar de puramente funcional.

Rubicón/Infancia Media: Desde la perspectiva de la psicología del desarrollo

En lo que se ha dicho hasta ahora, hemos tratado de dejar claro que, en el desarrollo infantil, el Rubicón se destaca como un hito con características tanto mentales como, en el sentido más amplio, organísmicas. De la forma en que Steiner lo presenta, todo el proceso se lleva a cabo entre la edad de los 8 y 11 años, y es la expresión de un proceso dinámico que impulsa el desarrollo del yo del niño. A pesar de que el concepto de Steiner del "Rubicón" no se usa como tal en la psicología moderna del desarrollo, todavía es posible

11. El concepto de "precepto sustituto" se deriva del ámbito de las profesiones terapéuticas y se ha modificado para su uso en el ámbito de la práctica educativa.

12. El maestro no está allí sólo para presentarle al niño lo verdadero, lo bueno y lo bello, sino en cierto sentido, ser parte de ello. Todo el contenido de la enseñanza debe ser colocado ante el niño en una manera ejemplar. La enseñanza debe ser una obra de arte, no un contenido teórico" (Steiner 1979, p. 221). Expresado en el lenguaje de la teoría estructural de la socialización, esto podría leerse: A través de experiencias sensoriales objetivas, ilustradas de acuerdo con la teoría artística y de..., el niño aprende…

establecer paralelos, tanto en el contenido como en la estructura, entre los dos estilos de enfoque. Esto lo haremos brevemente a continuación.

Aplicando términos de la psicología del desarrollo a los fenómenos relacionados con el Rubicón enumerados aquí, podríamos hablar, como Erikson lo expresa, del inicio de un sentimiento de identidad personal, que se percibe y se somete a escrutinio. Erikson, sin embargo, coloca la formación de la identidad personal firmemente en medio de la adolescencia (Erikson 2000; Marcia 1980).

Sin embargo, en el campo de la psicología del desarrollo está la idea relacionada del auto-concepto, que incorpora fácilmente las fases de la primera infancia (Unzner 2009, p. 13) y, en esta conexión habla de "los pensamientos, sentimientos y juicios de un individuo sobre sí mismo" (Unzner ibíd.; Roebers 2007). Existe evidencia empírica que muestra que la primera infancia es el período en el que comienza el desarrollo del auto-concepto. En consecuencia, los niños de dos años entienden los límites y limitaciones de su propio cuerpo. Un poco más tarde, pueden reconocerse en el espejo o en videos e imágenes, y comprender los signos de los sentimientos e intenciones de los demás. "El auto-concepto se diferencia cada vez más con el crecimiento de las capacidades cognitivas en el transcurso de la infancia, alcanzando un estado de estabilidad relativa alrededor de los diez años" (Unzner ibíd., p. 13).

La facultad de modificación del auto-concepto a menudo se considera en la literatura como el principal indicador de que el niño ha alcanzado la fase de la infancia media. Kathleen Dwyer, por ejemplo, asegura lo siguiente:

> "También durante la infancia media, los auto-conceptos de los niños y sus concepciones de los demás se vuelven más comprensibles, de modo que se centran cada vez más en los rasgos internos y abarcan generalidades a través de los comportamientos. Con un sentido más sólido de sí mismo, los niños son cada vez más capaces de regular sus propios comportamientos" (Dwyer 2005, p. 3).

Fegert (2011), quien ubica la infancia media entre las edades de 7 y 11 a 12 años, detecta la modificación del auto-concepto en la expansión de la actividad interna y externa del niño. Las "múltiples experiencias nuevas en una variedad de contextos de vida que involucran interacciones con un gran número de personas – en la escuela, en clubes deportivos, etc." son consideradas, según el autor, como factores que determinan este proceso de cambio (Fegert 2011, p. 11). Fegert subraya aquí la primera aparición de discriminación entre un yo ideal y un yo real. Mientras que el bebé aún tiene la experiencia de la unidad, el niño en edad escolar se vuelve capaz de hacer distinciones, en gran medida comparándose con los de su entorno social. Entre las habilidades motoras (auto-concepto físico), el aprendizaje académico y la vida social, una autoimagen heterogénea comienza a cristalizarse. Sobre esta base, Fegert diagnostica, desde la edad escolar, una caída típica de la autoestima que puede durar hasta la pubertad (Fegert ibíd.). Este autor ve una tendencia interior más hacia la crisis en la infancia media en la aparición de "sentimientos encontrados". El niño experimenta la aparición simultánea de sentimientos contradictorios, que muy bien pueden surgir de la tensión entre un sentimiento interno genuino y una expectativa social contrastante (Fegert ibíd., p. 12). Además, Fegert también enfatiza la edad de 10 años como una especie de mitad de la infancia media: A partir de los 10 en adelante, las estrategias de regulación emocional mejoran notablemente. El niño coloca mayor esfuerzo en:

- Estrategias de apoyo social
- Estrategias concretas de resolución de problemas
- Estrategias para evitar problemas

Un objetivo general es lograr la seguridad emocional en sí mismo (Fegert ibíd.).

Si hasta ahora la infancia media era incluida como una fase de desarrollo, como tema de investigación, recientemente se ha prestado mayor atención. En 2011 se dedicó una edición especial de la revista *Human Nature* a este tema, presentando artículos interculturales que abordaron la teoría de cómo evolucionó esta fase, así como sus correlatos fisiológicos y su variabilidad cultural y ecológica (Campell 2011).

En los últimos estudios, se considera que la infancia media tiene una influencia prominente en el desarrollo biográfico. En su relato de este período, Marco Del Giudice[13] y sus colaboradores consideran no sólo el conjunto de factores mentales, motores y sociales que aparecen entre los 6 y 12 años (como se mencionó anteriormente), sino también biológicos, o más precisamente, procesos endocrinológicos. Por ejemplo, es un hecho bien fundado que los niveles de cortisol alcanzan un pico dramático en los recién nacidos y posteriormente se mantienen estables, mientras que entre las edades de 6 y 9 hay un fuerte aumento en los andrógenos suprarrenales (Stolecke 1997, p. 103).

> "Este hito de maduración fisiológica y puramente biológica se designa como adrenarquia, y persiste en términos cuantitativos en la pubertad" (Stolecke ibíd.).

Del Giudice atribuye una función reguladora durante este período de la infancia a la adrenarquia. Este autor lo ve como mediador entre la historia de vida individual y la disposición genética (Del Giudice 2014, p. 5; West-Eberhard 2003). La responsabilidad de esto se asigna a una hormona suprarrenal que se forma sólo en seres humanos y primates superiores. En las niñas, la maduración de la glándula suprarrenal comienza a partir de los nueve años de edad con un aumento en la producción de la hormona 17-cetosteroide. En este momento, en la sangre se producen aumentos en la prohormona dehidroepiandrosterona (DHEA) y su forma sulfurada (DHEAS) (Del Giudice 2014, p. 4). Después de seis a doce meses, los signos de la pubarquia (inicios del crecimiento secundario del vello) se vuelven detectables como resultado de la transformación de la DHEA en la hormona sexual masculina testosterona. Esta hormona está presente al nacer, pero luego disminuye bruscamente sólo para reanudar la síntesis durante la infancia media. Su función aquí todavía es levemente definida.

La infancia media es el momento, antropológicamente hablando, en el que los niños pasan por un proceso sucesivo de emancipación con respecto a aquellos con quienes han tenido relación de vinculación primaria. Sin embargo, en contraste con los mamíferos en general, en esta etapa aún no se ha alcanzado la madurez sexual, y por lo tanto, tienen a su disposición un período adicional de tiempo para el desarrollo de la personalidad, durante el cual pueden expresarse los impulsos de su floreciente expresión. Aparte de todo esto, en numerosas culturas, los niños en esta edad tienen la función de compartir la responsabilidad de la producción y preparación de alimentos y de cuidar a sus hermanos menores. En general, no se puede asumir una edad legal específica en la cual tales responsabilidades se pueden otorgar a un niño, como se ha convertido en la norma en las culturas occidentales tecnológicamente desarrolladas.

A través de la investigación sobre la vinculación, también resulta cada vez más claro que la forma en que "se establecen los puntos" en este momento es de vital importancia para el futuro estado de salud de la persona afectada. Svenja Zellmer (2007), por ejemplo, llama la atención sobre la relación mutua entre resiliencia y vinculación en el período preescolar hasta la infancia media (Zellmer, 2007).

En la misma línea, podemos referirnos a la obra de Mary Jane West-Eberhard (2003), quien describe los eventos determinantes de la infancia media como relevantes para el desarrollo. Para esta autora, tales cambios del desarrollo pertenecen a una categoría de eventos que generan información del mundo circundante en una medida suficiente para ofrecer al individuo afectado una variedad de vías de desarrollo. En estas fases sensibles al cambio, los individuos afectados son particularmente vulnerables y, por lo tanto, necesitan orientación, porque los cambios emergentes pueden tener un efecto fundamental sobre su desarrollo posterior.

Teniendo en cuenta lo anteriormente presentado, parecería que el concepto de Steiner sobre el Rubicón está teniendo claros contornos modernos dentro del contexto de la investigación actual. Si bien con diferentes acentuaciones, las características principales atribuidas a este proceso de transformación pre-púbica (ajuste de la dirección biográfica, desarrollo de la identidad y expresión fisiológica) pueden muy bien contribuir como puntos de orientación para la investigación de la infancia media. Las nuevas implicaciones, tanto teóricas como empíricas, del concepto de Rubicón de Steiner siguen demostrando prácticas terapéuticas y métodos que hacen frente a las crisis.

13. Ver Del Giudice, Angeleri & Mnaera 2009; Colle & Del Giudice 2011 y Del Giudice 2014. La infancia media se describe aquí como un "punto de cambio en el desarrollo de la historia de la vida humana" (Colle & Del Giudice 2009).

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Psychometric Evaluation of the Preschool Health Examination at German Steiner Schools. Results of IPSUM, a Multicentre Cross-Sectional Validation Study

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ABSTRACT. *Background*: School readiness, which is assessed as part of the obligatory preschool health examination (PHE), may be an important predictor of educational and health outcomes during primary school. As part of the IPSUM research project "Age at school entry and health outcomes", we developed a standardized PHE suitable for German Steiner schools (Waldorf schools).
Objective: The aim of the present study was to validate the items and scales of the PHE in order to determine how well they measure school readiness.
Methods: The PHE instrument comprised 35 items assessing cognitive, sensory, and motor skills as well as anthropometric measures and was validated in 93 German Steiner schools using a cross-sectional study design. 4,789 preschoolers (mean age: 6.1 years; 46.3 % girls) who were examined by the PHE school teams were included.
Results: Analysis of the factor structure identified 6 factors covering anthropometric measures, second dentition, gross and fine motor skills, auditory memory, and cognitive/sensory skills. With a few exceptions, results showed satisfactory internal consistency (.62-.86), discriminatory power (.30-.78), and inter-rater reliability (.66-1.0). Linear and logistic regression analyses demonstrated that with the exception of fine motor skills, all factors were significantly related to age at the PHE and school readiness as determined by the school team.
Conclusion: The proposed PHE instrument is generally reliable and valid. We suggest some adaptations to further improve the quality of the PHE at German Steiner schools.

Keywords: school readiness, assessment at school entry, developmental status, age, validity

ZUSAMMENFASSUNG. *Hintergrund*: Die Schulreife, die im Rahmen der obligatorischen Schuleingangsuntersuchung beurteilt wird, könnte ein wichtiger Prädiktor für den Bildungserfolg und die gesundheitliche Entwicklung in der Grundschule sein. Im Rahmen des IPSUM-Forschungsprojekts „Einschulungsalter und Gesundheitsentwicklung" entwickelten wir eine standardisierte Schuleingangsuntersuchung für deutsche Waldorfschulen.
Ziel: Mit der vorliegenden Studie sollen die Items und Skalen der Schuleingangsuntersuchung validiert werden, um zu ermitteln, wie gut sie die Schulreife erfassen.
Methode: Die Schuleingangsuntersuchung umfasst 35 Items zur Beurteilung kognitiver, sensorischer und motorischer Fähigkeiten sowie anthropometrischer Größen und wurde anhand der Querschnittsdaten von 93

deutschen Waldorfschulen validiert. In die Analysen wurden 4789 Vorschüler einbezogen (mittleres Alter 6,1 Jahre, 46,3 % Mädchen), die von den Aufnahmegremien der Waldorfschulen untersucht wurden.
Ergebnisse: Die Analyse der Faktorenstruktur ergab 6 Faktoren, die anthropometrische Größen, Zahnwechsel, Grob- und Feinmotorik, auditives Gedächtnis und kognitive/sensorische Fähigkeiten beinhalten. Bis auf wenige Ausnahmen zeigten die Ergebnisse eine zufriedenstellende interne Konsistenz (.62-.86), Trennschärfe (.30-.78) und Interrater-Reliabilität (.66-1.0). Lineare und logistische Regressionsanalysen zeigten, dass mit Ausnahme der Feinmotorik alle Faktoren signifikant mit dem Untersuchungsalter und der vom Aufnahmegremium ermittelten Schulreife zusammenhängen.
Schlussfolgerung: Das vorgestellte Instrument ist weitgehend reliabel und valide. Wir schlagen einige Anpassungen vor, um die Qualität der Schuleingangsuntersuchung an deutschen Waldorfschulen noch weiter zu verbessern.

Schlüsselwörter: Schulreife, Einschulungsuntersuchung, Entwicklungsstand, Alter, Validität

Introduction

School entry is a major change in a child's life, combined with many new demands the child has to cope with (Griebel & Niesel, 2002). As there is great heterogeneity in school-relevant skills at the time of school entry, the preschool health examination (PHE) in Germany serves to assess school readiness and thus the developmental status of all children of compulsory school age in order to ensure that they will be able to meet the school requirements (Oldenhage, Daseking, & Petermann, 2009). Children with developmental deficits relevant for school readiness are identified so that targeted interventions can be initiated or school entry deferred. In this way, the emergence of school difficulties are prevented, disadvantages for young children are reduced, and differences in development between the children starting school are diminished (Horstschräer & Muehler, 2014).

The criteria for school readiness collected during the PHE are characteristics and skills that predict school performance in the future. These usually include cognitive skills, motor skills, and social-emotional skills (Kammermeyer, 2000; Oldenhage et al., 2009). With regard to cognitive skills, domain-specific precursors of writing, reading, and mathematics have turned out to be important: These include phonological awareness (e.g., Bus & van Ijzendoorn, 1999; Schneider & Näslund, 1999), which is the awareness of the most basic speech units of a language (i.e., phonemes) as well as larger units such as rhymes and syllables (Castles & Coltheart, 2004), auditory memory, and grammatical skills (e.g., Daseking & Petermann, 2008) as well as quantity-number competencies like counting, quantity discrimination, and linking number-words with quantity (Duncan et al., 2007; Krajewski & Schneider, 2006, 2009). Moreover, selective and visual attention are a prerequisite for acquiring academic skills (e.g., Kinsey, Rose, Hansen, Richardson, & Stein, 2004). Further predictors of academic achievement are fine motor skills such as visual-spatial integration (e.g., Cameron et al., 2012) and visual-motor coordination (Oberer, Gashaj, & Roebers, 2018), while gross motor skills are especially influential on psychosocial development (because children with motor skill problems are more likely to be excluded or teased) (Bejerot, Plenty, Humble, & Humble, 2013). Social-emotional skills that are related to school performance are independence, responsibility, engaging in conversation and cooperation, as well as persistence in tasks (McClelland, Acock, & Morrison, 2006; Petermann, Petermann, & Krummrich, 2008), but also more domain-general characteristics such as working memory (e.g., Berg, 2008) and self-regulation abilities. In particular, executive functions are important indicators of school readiness (Blair & Raver, 2015; Oberer et al., 2018).

Due to the time constraints of the PHE, only a selection of school-relevant skills can be assessed. There are differences in the tested skills and the underlying concept of school readiness between the PHEs of German public schools and Steiner schools. According to the prevailing view of school readiness on which the PHEs of public schools are based, school readiness is not a characteristic of a child, but is developed jointly by child and family, nursery school, and primary school (Kammermeyer, 2000). Hence, the PHE does not aim at selecting school-ready children, but rather at determining the need for compensatory special support regarding school-relevant skills and at avoiding deferred entry to school (Oldenhage et al., 2009). In

contrast, Steiner education holds the view of school readiness that children who are not mature in relevant developmental skills should wait until they are ready for school, resulting in a higher proportion of deferred entries to school compared to public schools (Statistisches Bundesamt, 2013). Steiner education argues that the same structural forces first drive growth and physical development in preschoolers and subsequently work on cognitive development. If these forces are used for cognitive development too early because of a young age at school entry, they are no longer available for physical developmental processes, possibly leading to an impairment of the child's health and performance. Therefore, more emphasis is placed on maturity and physical development in the context of school readiness, so that during the PHEs in Steiner schools, particular attention is paid to characteristics such as the change of physical proportions (form changes) and the onset of second dentition (Patzlaff, Boeddecker, & Schmidt, 2006).

The IPSUM research project investigated whether the age at school entry and the child's school readiness or developmental status as assessed by PHE is relevant to the long-term development of its health and school performance (Patzlaff et al., 2006). Within this project, a standardized PHE suitable for Steiner schools was developed for participating schools over several years. The aim of the present work was the psychometric evaluation of the final PHE version. This cross-sectional study examined the factor structure of the instrument, its reliability, specifically its internal consistency and inter-rater reliability, as well as discriminatory power of the items. However, our main focus was on the validity of the instrument. It was determined how well the criteria used for school readiness actually measure school readiness as understood by Steiner education: Acceptable criteria for measuring school readiness are those that i) depend on age, meaning skills that will improve as children grow older, and ii) are related to school readiness as determined by experienced school teams that carry out the PHE and decide whether a child is ready for school entry.

Methods

The IPSUM research project

The IPSUM project comprised the development and validation of a PHE suitable for German Steiner schools and the initiation of a nation-wide population-based multicentre prospective cohort study with an open cohort design in cooperation with the German Association of Steiner Schools (Patzlaff et al., 2006). In 2003, all German Steiner schools (with the exception of special education schools) were asked to implement a newly developed, standardized PHE and to document the test results. Following pre-tests since 2004 and a large pilot study in 2007 (65 schools), the definitive cohort study was initiated in 2008 (88 schools). The study protocol was reviewed and approved by the ethics committee of the Federal Physician Chamber in Frankfurt/Main (Hesse; Germany). Written informed consent was obtained from parents/legal guardians prior to study enrolment.

Participants

All preschoolers registered for the PHE in 2007 or 2008 at a participating school underwent the PHE, and those whose parents provided informed consent were included in the study. Ultimately, 6171 children from 93 German Steiner schools were enrolled. For the present analysis, only children who were born within the school entry cut-off dates for German Steiner schools were selected (for 2007, children born between 30 June 2000 and 1 July 2001, and for 2008 between 30 June 2001 and 1 July 2002). This restriction was chosen because the PHE was designed for children in this age range. Furthermore, excluding particularly old children with a deferred entry to school or children who were too young for school entry could prevent bias in the results. Thus, data from 1382 children were excluded from the analysis, leaving a final study sample of 4789 participants (46.3 % girls, 53.7 % boys, aged 5.4 - 7.1 years). The distribution of school readiness categories, gender, and age are given in Table 1.

Inter-rater reliability of the PHE items was investigated in 2008 in one of the participating schools in a subsample of 105 preschoolers. Of these, 50 were girls (47.6 %) and 55 were boys (52.4 %), aged 5.6 to 7.0 years (mean age = 6.2 years).

Table 1
Sample characteristics: Distribution of school readiness categories, gender, and age (N=4789)

School readiness judgement	Gender	*N*	Mean age at PHE (Standard deviation)
School ready	Girls	1928	6.15 (0.29)
	Boys	2022	6.19 (0.28)
	Total	3950	6.17 (0.28)
Questionable school readiness	Girls	145	5.87 (0.24)
	Boys	308	5.96 (0.27)
	Total	453	5.93 (0.26)
Not school ready	Girls	83	5.80 (0.20)
	Boys	163	5.83 (0.20)
	Total	246	5.82 (0.20)
Missing data	Girls	59	6.05 (0.27)
	Boys	81	6.13 (0.29)
	Total	140	6.10 (0.28)

Abbreviations: PHE = preschool health examination.

Development of the PHE

The primary aim of the PHE was the accurate estimation of a child's school readiness. In this context, items of the PHE should meet two major requirements: i) items should reflect developmental aspects (thus, item responses should vary with biological age) and ii) items should be able to predict judgements of an expert committee regarding school readiness of an individual child. Therefore, items of already established and validated instruments such as the MoMo (Motorik-Modul; Woll, Kurth, Opper, Worth, & Bos, 2011), the Mottier-Test of the ZLT (Zürcher Lesetest; Linder & Grissemann, 2000), and the FEW-2 (Frostigs Entwicklungstest der visuellen Wahrnehmung – 2; Büttner, Dacheneder, Schneider, & Weyer, 2008) were reviewed with regard to their suspected ability to meet these requirements.

From 2004 to 2006, preliminary PHE versions were elaborated, evaluated, and revised in an iterative circle. Finally, 35 items covering three major domains were identified and selected for the PHE: The first 10 items are indicators of physical development, for example the onset of second dentition. The subsequent 12 items refer to motor skills – of these, 8 items capture gross motor skills (performed with legs) and 4 items fine motor skills (performed with hands). The last 13 items refer to sensory and cognitive skills – among them are items capturing auditory memory (copying rhythm patterns, repeating sequences of syllables, also referred to as pseudoword repetition), instant recognition of quantities and counting, working memory (remembering quantities), visual perception (grasping a form), and visual-spatial integration (copying a figure). A more detailed description of each item and the rating scales is given in the Appendix. Parallel to item selection and the development of response categories, a PHE documentation sheet containing the examination items and standard operating procedures detailing the appraisal of the child's developmental status were prepared.

Validation procedures

In 2007 and 2008, the final version of the PHE was used by the PHE school teams of the respective Steiner schools. Teams usually consist of a school doctor, a teacher, and/or a therapeutically working staff member. Depending on the school, the PHE was executed by the doctor and/or the teacher. Altogether the examination usually lasted 20 - 25 minutes. As a result of the examination, the PHE school team rated the preschooler as being school ready, not school ready, or having an intermediate or questionable school

readiness status. This final judgement was based on their expert opinion and was reached after a short discussion. Criteria for judging school readiness were not provided, so the judgement of the committee was not influenced by the study team.

In the PHEs in which inter-rater reliability was investigated, all preschoolers were assessed independently by the same two raters. Both raters were present during the PHEs without mutual interaction, observed the respective participant fulfilling the tasks, and noted their assessments down in two separate documentation sheets without discussing their assessments.

Data analysis

Eleven items were inverted so that higher scores always mirror higher levels of features or skills. Missing values of ratio-scaled items were imputed using single imputation by regression with the independent variables gender and age at PHE. Age at PHE was computed for each child as the difference between the date of PHE and the date of birth.

As the items of the PHE address three domains, a principal component analysis with varimax rotation was carried out to examine the factor structure of the items. Discriminatory power (corrected item-total correlation coefficient r_{itc}) of the items was calculated to assess how well the single items reflect the subscales resulting from the principal component analysis and how well the items are able to distinguish between children with different levels of features or skills. Values lower than .30 indicate poor discriminatory power (Fisseni, 1997).

To evaluate the reliability of the PHE, internal consistency and inter-rater reliability were investigated. Internal consistency was determined by calculating Cronbach's α for the subscales, which should not be lower than .70 for a satisfying result (Schmitt, 1996). Since items have different result scales, all item values were z-transformed in order to obtain a standardized result scale (with mean = 0 and standard deviation = 1). These standardized values were used for the principal component analysis as well as for calculating discriminatory power and internal consistency.

Regarding inter-rater reliability, different measures of agreement in the absolute values raters assigned to the same participant were computed: For dichotomous items, Cohen's kappa was determined, and for ordinal- and ratio-scaled items as well as for the school readiness judgement, intra-class correlation coefficients (two-way random, absolute agreement) were computed. Poor inter-rater reliability is indicated by Cohen's kappa coefficients lower than .40 (Bortz & Döring, 2006) and intra-class correlation coefficients lower than .50 (Wirtz, 2004). To detect significant differences between the ratings, McNemar's tests were used for dichotomous items, sign tests for ordinal-scaled items, and t-tests for ratio-scaled items. Inter-rater reliability was assessed for all but four items: Anthropometric measures were removed from the analysis, because they were not measured independently by the two raters. Instead, a third person from the PHE school team took the measurements and reported the results, which were written down into the documentation sheets by the raters.

In order to investigate how a child's subscale score individually influences the school readiness judgement of the PHE school team, subscale scores were formed from item scores based on the result of the principal component analysis: The standardized values of those items loading highest on a common factor were averaged (if < 50 % of the item values were missing) and the resulting subscale scores were again z-transformed. Initially an ordinal regression analysis was performed with the above mentioned three categories of the school readiness judgement as dependent variable and the standardized scores of the six subscales as independent variables. The ordinal regression model turned out to be invalid because the test of parallel lines was significant, which indicated that the regression coefficients change across the three categories of the school readiness variable. Hence, we conducted two multiple binary logistic regression analyses instead: the first one with the categories school ready vs. not school ready or questionable school readiness as the dependent variable and the second one with the categories school ready or questionable school readiness vs.

not school ready as the dependent variable. Effect estimates (regression coefficients *B*) and standard errors were adjusted for gender and age on the 1st of July[1].

Age dependence of the subscale scores was investigated using linear regression analyses with age at PHE as an independent variable and the standardized scores of each subscale as the respective dependent variable. Results were adjusted for gender. All statistical analyses were performed using IBM SPSS Statistics version 23.

Results

Evaluation of the factor structure

Based on the number of factors with eigenvalues greater than 1, ten factors were extracted by principal component analysis. Because there were some factors on which only two items had their highest loadings, we decided for a six-factor solution that was suggested by the scree test. The six extracted factors explained 46% of the total variance and corresponded with the domains of the PHE, but further divided domains into two factors each. The highest loading of each item on the extracted factors is shown in Table 2. The items of the physical form domain loaded highest on two factors addressing anthropometric measures (Factor 2) and second dentition (Factor 5). The items of the motor skills domain loaded highest on two factors covering gross and fine motor skills (Factor 3 and Factor 1, respectively) and the items of the sensory and cognitive skills domain on two factors referring to auditory memory (Factor 4) and cognitive/sensory skills (Factor 6). This structure of three domains which can be further subdivided into six factors or subscales are also roughly observable in product-moment correlations between the items. As illustrated in Figure 1, associations between items forming a subscale are stronger than between items of different subscales.

Reliability and item analysis

Inter-rater reliability. Results of the inter-rater reliability analysis are reported in Table 3. Regarding the dichotomous items, Cohen's kappa coefficients showed good to very good agreement between the raters for five of six items ($\varkappa$ > .6 or > .75), and this was confirmed by non-significant McNemar's tests (all *p*s > .2). Solely for the tooth gaps item, agreement was rather low; the McNemar's test also yielded significant differences between the raters ($p < .01$).

The intra-class correlation coefficients (two-way random, absolute agreement) revealed very good inter-rater reliability for the ordinal- and ratio-scaled items (all ICC(2,1) > .9).[2] Accordingly, sign tests showed no significant differences between the raters for the ordinal-scaled items (all *p*s > .3) and t-tests for the ratio-scaled items (backward tight-rope walk, frequency of stepping off: t(102) = 0.58, $p = .57$; jumping sideways, number of jumps in 10 seconds: $t(102) = 1.42$, $p = .16$).

Internal consistency. Cronbach's α was calculated for the six subscales (see Table 4). The internal consistency coefficients of four of the subscales (gross motor skills, fine motor skills, anthropometric measures, and auditory memory) were acceptable to good. The second dentition subscale initially showed a questionable internal consistency of $\alpha = .66$, but the reliability analysis revealed that removing loose teeth and tooth gaps items would increase internal consistency of this subscale. Since the tooth gaps item also demonstrated low inter-rater reliability, and the loose teeth and tooth gaps items additionally have poor discriminatory power (as will be shown in the following subsection), we decided to exclude these items from the subscale. With the remaining three items, the second dentition subscale reached acceptable internal consistency. The low internal consistency coefficient of the cognitive/sensory skills subscale cannot be improved by eliminating an item. Thus, all but one of the subscales can be considered to be sufficiently reliable.

1. Because PHEs took place in different temporal distances to the school entry cutoff date, the PHE school team took into account not the age at PHE, but how old children will be at the cutoff date.

2. For items that involve hopping on the right and on the left leg, results refer to corrected data after discovering a documentation mistake.

Table 2
Factor structure of the preschool health examination items (N = 2860)

		Factors					
		1	2	3	4	5	6
	Initial eigenvalue	5.28	3.43	2.26	1.87	1.76	1.52
	Explained variance (rotated)	10.3 %	8.1 %	8.0 %	6.7 %	6.7 %	6.2 %
Items of domain „physical form“	Form changes		.37				
	Second dentition					.86	
	Loose teeth					.45	
	Tooth gaps					.47	
	New incisors					.69	
	New molars					.69	
	Body length		.88				
	Span		.85				
	Head circumference		.58				
	Body weight		.84				
Items of domain „motor skills”	Backward tight-rope walk 1	.34					
	Backward tight-rope walk 2	.43					
	Hopping on right leg 1	.78					
	Hopping on left leg 1	.78					
	Hopping on right leg 2	.81					
	Hopping on left leg 2	.80					
	Jumping sideways 1	.45					
	Jumping sideways 2	.54					
	Finger-thumb opposition 1			.77			
	Finger-thumb opposition 2			.78			
	Rapid hand-turning 1			.80			
	Rapid hand-turning 2			.78			
Items of domain „sensory and cognitive skills“	Copying a rhythm pattern 1				.62		
	Copying a rhythm pattern 2				.71		
	Copying a rhythm pattern 3				.69		
	Repeating syllables 1				.52		
	Repeating syllables 2				.55		
	Repeating syllables 3				.51		
	Recognition of quantities						.61

Remembering quantities	.56
Continuing counting	.54
Number memory	.57
Grasping a form	.30
Copying a figure (cross)	.50
Copying a figure (fish)	.46

***Note*. The highest loading of each item on the extracted factors is presented.**

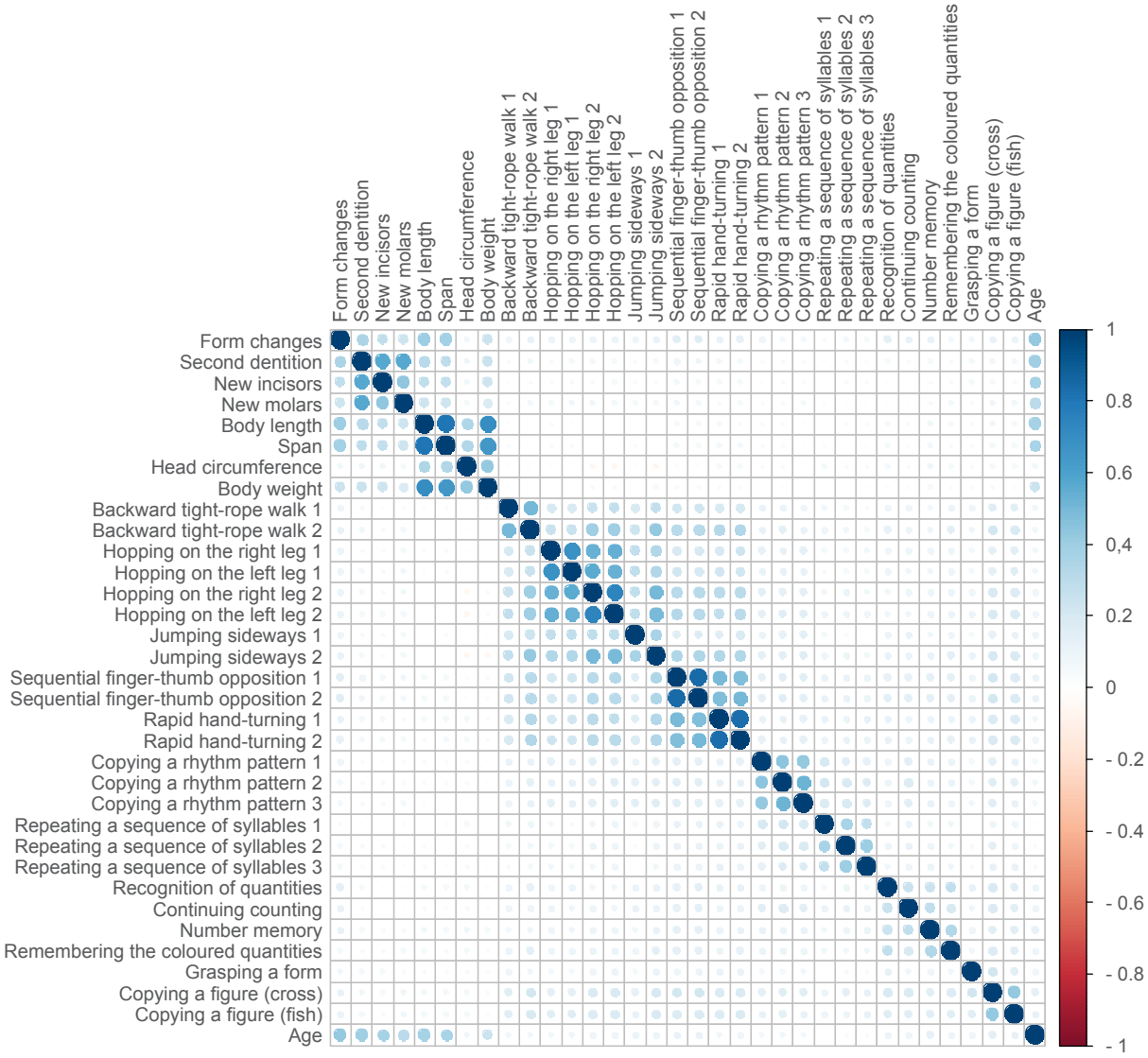

Figure 1. Correlation matrix for the relationship between age at preschool health examination and item scores as well as for the relationship between the item scores (N = 2860, list-wise deletion), presented without later excluded loose teeth and tooth gaps items.

Discriminatory power. For all items, discriminatory power was determined. Table 4 shows the range of coefficients of the items separately for each subscale. The second dentition subscale and the cognitive/sensory skills subscale contain single items with low discriminatory power, the items of the other subscales have acceptable to good discriminatory power (r_{itc} > .3 or > .5). Regarding the second dentition subscale, only items registering loose teeth and tooth gaps cannot sufficiently distinguish between children with a different second dentition status (r_{itc} = .24 and .27, respectively) and finally were removed from further analysis. All items within the cognitive/sensory skills subscale except for the grasping a form item (r_{itc} = .20) have satisfying discriminatory power (r_{itc} > .3). Thus, apart from very few items, discriminatory power is sufficiently high.

Table 3
Inter-rater reliability of the preschool health examination items (N = 105)

Item	Cohen's kappa / Intraclass correlation [a]	*p*[b]
Dichotomous items:		
Second dentition	1.0	1.0
Loose teeth	.66	1.0
Tooth gaps	.40	.008
New incisors	.98	1.0
New molars	.94	.25
Number memory	1.0	1.0
Ordinal-scaled items:		
Form changes	.92	1.0
Backward tight-rope walk 2	1.0	1.0
Hopping on right leg 1	.99	1.0
Hopping on left leg 1	.98	1.0
Hopping on right leg 2[c]	.98	.63
Hopping on left leg 2[c]	.97	.63
Jumping sideways 2	.99	1.0
Finger-thumb opposition 1	.97	1.0
Finger-thumb opposition 2	1.0	1.0
Rapid hand-turning 1	.98	1.0
Rapid hand-turning 2	.97	.38
Copying a rhythm pattern 1	.97	.50
Copying a rhythm pattern 2	1.0	1.0
Copying a rhythm pattern 3	1.0	1.0
Repeating syllables 1	1.0	1.0
Repeating syllables 2	.99	1.0
Repeating syllables 3	.99	1.0
Recognition of quantities	1.0	1.0
Remembering quantities	1.0	1.0
Continuing counting	.96	1.0
Grasping a form	1.0	1.0
Copying a figure (cross)	1.0	1.0
Copying a figure (fish)	1.0	1.0

School readiness judgement	.96	.50
Ratio-scaled items:		
Backward tight-rope walk I	.997	.57
Jumping sideways I	.999	.16

[a] Cohen's kappa for dichotomous items, intraclass correlation (two-way random, absolute agreement) for ordinal- and ratio-scaled items.
[b] McNemar's test for dichotomous items, sign test for ordinal-scaled items, t test for ratio-scaled items.
[c] Corrected data after discovering a documentation mistake.

Table 4
Internal consistency and range of discriminatory power of the six subscales

Subscales	*N*	Number of items	Cronbach's α	Range of discriminatory power
Gross motor skills	3968	8	.82	.37 - .70
Anthropometric measures	4485	5	.79	.30 - .78
Fine motor skills	4529	4	.86	.70
Auditory memory	4442	6	.69	.35 - .49
Second dentition[a]	4545	3	.75	.55 - .66
Cognitive/sensory skills	3928	7	.62	.20 - .39

[a] Coefficients after elimination of two items: Loose teeth and Tooth gaps.

Criterion validity

Relationship between subscale scores and school readiness judgement. Coefficients from the multiple binary logistic regressions of subscale scores on school readiness judgement are presented in Table 5. The first regression analysis with the categories school ready vs. not school ready or questionable school readiness as a dependent variable (see the left side of Table 5) yielded highly significant effects on the school readiness judgement for all six subscales (all *ps* < .01). The scores on the cognitive/sensory skills subscale and the anthropometric measures subscale have the strongest influence on whether a child is rated as school ready. Smaller regression coefficients, that is weaker effects on the school readiness judgement, than for these two subscales are obtained for the gross motor skills subscale and the second dentition subscale, and the weakest effects are found for the auditory memory subscale and the fine motor skills subscale.

The second regression analysis with the categories school ready or questionable school readiness vs. not school ready as dependent variable (see the right side of Table 5) showed slightly different results. Although in both analyses fine motor skills have the smallest effect on the school readiness judgement, the effect missed statistical significance in the second analysis ($p > .05$). For the other five subscales, effects are highly significant (*ps* < .01). To distinguish children who are not school ready from the rest of the children, anthropometric measures appear to be more important than cognitive/sensory skills – that is, the order is reversed compared to the first analysis. The same holds for the gross motor skills subscale and the second dentition subscale: Whereas in the first analysis, the regression coefficient is larger for the gross motor skills subscale, it is now smaller than that for the second dentition subscale. In summary, to judge a child as school ready, cognitive/sensory skills appear to matter the most, while to judge a child as not school ready, anthropometric measures are most relevant.

Table 5

Relationship between the six subscale scores and the school readiness judgement (dependent variable) as assessed by binary logistic regression analyses (N = 4267)

	School ready[a]			School ready or questionable school readiness[b]		
Independent variable[c]	*B*[d]	Standard error	p	*B*[d]	Standard error	p
Gross motor skills	0.36	0.06	<.001	0.25	0.09	.004
Anthropometric measures	0.52	0.06	<.001	0.58	1.0	<.001
Fine motor skills	0.23	0.06	<.001	0.15	0.08	.076
Auditory memory	0.25	0.05	<.001	0.23	0.08	.004
Second dentition	0.29	0.06	<.001	0.28	1.0	.004
Cognitive/sensory skills	0.72	0.06	<.001	0.56	0.08	<.001

[a] vs. not school ready or questionable school readiness.
[b] vs. not school ready.
[c] Standardized subscale scores.
[d] Non-standardized regression coefficient; results are adjusted for age at cut-off date (1st July) and gender.

Age dependence of the subscale scores. Table 6 shows the results of the linear regression analyses that examined how a child's score on each subscale depends on his/her age at the PHE. Age has a highly significant effect on all six subscales (all *ps* < .01). Regression coefficients reveal that the largest effects are obtained for second dentition and anthropometric measures. Age dependence is lower for cognitive/sensory skills and gross motor skills, and the lowest age dependence is found for fine motor skills and auditory memory. This finding is also reflected in product-moment correlations between item scores and age at PHE, depicted in the first row/column of the correlation matrix in Figure 1: The strongest positive associations with age at PHE are obtained for the first six items that belong to the second dentition subscale and the anthropometric measures subscale. Solely the head circumference and body weight items of the anthropometric measures subscale show no clear association with age.

Table 6

Relationship between age at preschool health examination and the subscale scores as assessed by linear regression analyses

Dependent variable[a]	*N*	*B*[b]	Standard error	*p*
Gross motor skills	4707	0.42	0.05	< .001
Anthropometric measures	4789	1.09	0.05	< .001
Fine motor skills	4696	0.34	0.05	< .001
Auditory memory	4690	0.37	0.05	< .001
Second dentition	4545	1.25	0.05	< .001
Cognitive/sensory skills	4717	0.69	0.05	< .001

[a] Standardized subscale scores.
[b] Non-standardized regression coefficient; results are adjusted for gender.

Discussion

In the present study, we evaluated the psychometric properties of a newly developed, standardized PHE suitable for German Steiner schools and investigated how well the subscales and items of the instrument measure school readiness. Analysis of the factor structure revealed that the 35 items can be grouped into six subscales covering gross motor skills, anthropometric measures, fine motor skills, auditory memory, second dentition, and cognitive/sensory skills. Inter-rater reliability of the items is for the most part very good, with the exception of the tooth gaps item where agreement between the raters is poor. The items show satisfactory discriminatory power apart from items referring to loose teeth, tooth gaps, and grasping a form. Internal consistency of the subscales is sufficiently high; only for the cognitive/sensory skills subscale is it questionable. Following some minor adjustments to the present PHE, this validated examination may be used henceforth by German Steiner schools.

Subscales or items measuring school readiness should be related to the school readiness concept of Steiner schools as well as depend on the age of the preschooler. Our results confirm that all subscales fulfil these requirements except the fine motor skills subscale, for which the relationship with the school readiness judgement was partly not significant. The anthropometric measures subscale belongs to the two subscales with the strongest effects on school readiness judgement and has the second strongest age dependence. The other subscale that belongs to the two subscales with the strongest effect on school readiness judgement is the cognitive/sensory skills subscale. In terms of age dependence, this subscale is also among the better half of the subscales. The second dentition subscale has a medium influence on school readiness judgement compared to the other subscales, but shows the strongest age dependence. For the gross motor skills subscale, both the influence on school readiness judgement and age dependence are medium compared to the other subscales. The auditory memory subscale is the second weakest subscale in terms of both the effect on school readiness judgement and age dependence. The weakest effect on school readiness judgement (which even failed to reach significance in one analysis) as well as the weakest age dependence has the fine motor skills subscale.

These findings could be used to adapt and improve the PHE at German Steiner schools as follows: Items registering loose teeth and tooth gaps should no longer be collected in future PHEs due to their low discriminatory power. The reason for their small correlation with the second dentition subscale score could be that loose teeth and tooth gaps are temporary and may not be present at the moment of PHE despite ongoing tooth change. However, the other items of the second dentition subscale should remain in the PHE since this subscale has proven to be a good measure of school readiness.

The item of grasping a form also appears to be unsuitable for use in future PHEs because of low discriminatory power. As an item capturing visual perception, it should be relevant for acquiring school skills. Particularly mathematical skills have been demonstrated to be influenced by visual perceptual abilities (Daseking & Petermann, 2011; Werpup & Petermann, 2016), but they are also important for orthographic skills and reading development (Boets, Wouters, van Wieringen, De Smedt, & Ghesquiere, 2008). There are several possible reasons for the poor results of the grasping a form item: One reason could be incomplete standardization – the examiner drew half a pine tree for each child instead of providing it with a printed copy –, another could be that the specific motif is unsuitable for some reason and should be replaced. It is also possible that the type of task is unsuitable. Another frequently used task from the domain of visual perception could be chosen based on other validated instruments measuring school readiness such as GSS (Göppinger sprachfreier Schuleignungstest; Kleiner, 1998) or DVET (Duisburger Vorschul- und Einschulungstest; Meis, 1997), for example identifying two identical images in a series of images.

The unsatisfactory internal consistency of the cognitive/sensory skills subscale should not be given too much weight as the subscale measures school readiness well. The low Cronbach's α in this case is due to the fact that the subscale is heterogeneous in content since it comprises items referring to quantity-number competencies, working memory, visual perception, and visual-spatial integration. These skills should continue to be tested in future PHEs because evidence shows that they are important predictors of school

performance (see Introduction section) and they are part of many validated school entrance tests such as the GSS, WTA (Weilburger Testaufgaben für Schulanfänger; Hetzer & Tent, 1994), KST (Kettwiger Schuleingangstest; Meis, 1990), or Schulfähigkeitstest Form C (Seyfried & Karas, 1987).

The fine motor skills subscale could be removed from future PHEs because it measures school readiness poorly. However, fine motor skills would not thereby be omitted, since the two copying a figure items from the cognitive/sensory skills subscale assess visual-spatial integration, which entails both visual processing and fine motor skills. Also in the validated school entrance tests, fine motor skills are assessed almost exclusively by using tasks in which children have to copy figures, for example in the GSS, DVET, or S-ENS (Screening des Entwicklungsstandes bei Einschulungsuntersuchungen; Döpfner, Dietmair, Mersmann, Simon, & Trost-Brinkhues, 2005).

As the second weakest subscale in measuring school readiness, the auditory memory subscale should be subjected to a single item analysis. Pseudoword repetition or other tasks measuring auditory memory are used in some of the validated school entrance tests (e.g., S-ENS, Schulfähigkeitstest Form C), but rhythm skills are not assessed at all. However, there is evidence for a relationship of rhythm skills with phonological awareness and early measures of literacy (Moritz, Yampolsky, Papadelis, Thomson, & Wolf, 2013; Ozernov-Palchik, Wolf, & Patel, 2018), because the processing of certain aspects of auditory temporal structure may be shared (Goswami, 2011). But as phonological awareness appears to be a stronger predictor of reading abilities than rhythm skills (Ozernov-Palchik et al., 2018), it would be worth considering replacing the copying a rhythm pattern items with items measuring phonological awareness in future PHEs developments. These would complement the pseudoword repetition items well since for example Boets et al. (2008) demonstrated that verbal short-term memory measured by a pseudoword repetition test together with phonological awareness predicts reading and spelling development.

The gross motor skills subscale measures school readiness moderately well according to our results. For its mediocre importance, this subscale contains relatively many items and could be shortened in future PHEs after a single item analysis has been carried out. In other validated school entrance tests, gross motor skills are rarely assessed (an exception is S-ENS which includes the task of jumping sideways). This is in line with evidence summarized by Cameron, Cottone, Murrah, and Grissmer (2016), showing that gross motor skills are related to the development of social competencies and physical well-being but they are not as strongly associated with academic achievement as fine motor skills.

Limitations

Certain indicators of school readiness mentioned in the Introduction section are not yet covered by the PHE, such as attention, self-regulation abilities, and social-emotional skills. If fine motor skills items would be removed from the PHE, they could be replaced by selective attention tasks or self-regulation tasks. As social-emotional skills are not easily tested within the PHE, Petermann et al. (2008) suggest to include assessments of social and learning behaviour from nursery school teachers.

So far, the school readiness judgement does not result directly from the item scores, but from the subjective ratings of the PHE school team based on their expert knowledge and opinion. This procedure should be made further objective by weighting the PHE items according to their determined relevance for the school readiness judgement and generating a school readiness score.

Conclusions

Overall, the investigated PHE instrument proved to be sufficiently reliable and valid and hence appears suitable for assessing school readiness of preschoolers. Unsatisfactory results were obtained only for the fine motor skills subscale and a few individual items, which should be removed in future updates of the PHE.

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Appendix

Table

Description of the preschool health examination items and their rating scales

Item	Brief description	Rating
I. Physical form		
Form changes	Limb extension, visibility of the joints, flattening of the ribcage, forming of the waist	Yes / No / In transition
Second dentition	Look into the mouth to see if change of teeth has started	No / In transition
Loose teeth		Yes / No
Tooth gaps		Yes / No
New incisors		Yes / No
New molars (6er)		Yes / No
Body length	Measured without shoes in upright posture	Number (in cm)
Span	Measured from the longest finger tip of one side to the longest finger tip of the other side with arms stretched out horizontally	Number (in cm)
Head circumference	Measured above the eyebrows	Number (in cm)
Body weight	Weighed without shoes	Number (in kg)
II. Motor skills.		
Backward tight-rope walk 1	The way the child balances backwards on a 3 meter long strip, frequency of stepping off	Number
Backward tight-rope walk 2	The way the child balances backwards on a 3 meter long strip, qualitative	5-point scale
Hopping on the right leg 1	Hopping on a marked cross 10 times with the right leg, number of hops	9-10 / 7-8 / 5-6 / 3-4 / <3
Hopping on the left leg 1	Hopping on a marked cross 10 times with the left leg, number of hops	9-10 / 7-8 / 5-6 / 3-4 / <3
Hopping on the right leg 2	Quality of the hopping on the right leg	5-point scale
Hopping on the left leg 2	Quality of the hopping on the left leg	5-point scale
Jumping sideways 1	Jumping from side to side between two small fields using both feet, as many jumps as possible in 10 seconds	Number
Jumping sideways 2	Quality of the side-to-side jumping	5-point scale
Sequential finger-thumb opposition 1	All fingers of the left hand touch the left thumb one after the other, running the complete sequence back and forth	5-point scale
Sequential finger-thumb opposition 2	All fingers of the right hand touch the right thumb one after the other, running the complete sequence back and forth	5-point scale
Rapid hand-turning 1	Child turns the palm of the left hand up and down about 4 times per second, standing in front of the examiner	5-point scale

Rapid hand-turning 2	Child turns the palm of the right hand up and down about 4 times per second, standing in front of the examiner	5-point scale
III. Sensory and cognitive skills		
Copying a rhythm pattern 1	Examiner taps the 1st rhythm on the table, child taps back: v v – v v – (v short, – long) one repetition allowed	3-point scale (1st attempt / 2nd attempt / not successful)
Copying a rhythm pattern 2	Examiner taps the 2nd rhythm on the table, child taps back: – v v – – (v short, – long), one repetition allowed	3-point scale (as above)
Copying a rhythm pattern 3	Examiner taps the 3rd rhythm on the table, child taps back: v v v v – – (v short, – long), one repetition allowed	3-point scale (as above)
Repeating a sequence of syllables 1	The child repeats the 1st sequence of syllables (pseudoword): to-pa-mo-ki, one repetition allowed	3-point scale (1st attempt / 2nd attempt / not successful)
Repeating a sequence of syllables 2	The child repeats the 2nd pseudoword: ka-to-pi-na-fe, one repetition allowed	3-point scale (as above)
Repeating a sequence of syllables 3	The child repeats the 3rd pseudoword: ga-li-no-ma-re-se, one repetition allowed	3-point scale (as above)
Recognition of quantities	Instant recognition (without counting) of the quantities of differently coloured beads (6 red, 4 blue)	3-point scale (6 were recognized / 4 were recognized / neither of the quantities was recognized)
Continuing counting	The child should continue counting from 10 to 20: with no errors / the child began counting again from 1 and then counted to 20 with no errors / the child counted with errors	3-point scale
Number memory	The child should remember that a total of 10 beads are hidden under the examiner's hand	Yes / No (the correct number was remembered or not)
Remembering the coloured quantities	The child should remember that 4 blue and 6 red beads are hidden under the examiner's hand	3-point scale (both quantities were remembered / one of the two quantities was remembered / neither of the quantities was remembered)
Grasping a form	Half a pine tree is dawn for the child without naming it, the child should recognize the pine tree	3-point scale (pine tree is recognized when the sheet is on the table / recognized after the sheet is raised / not recognized)
Copying a figure (cross)	The cross is drawn for the child without naming it, the child copies it	5-point scale
Copying a figure (fish)	The fish is drawn for the child without naming it, the child copies it	5-point scale

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Practical Investigation of the impact of Classroom Lighting on Student Behaviour: A comparison of LED and incandescent Light

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ABSTRACT. The European Union has taken several steps to ban the production and trade of incandescent and halogen lamps in the near future because energy consumption is higher than for light-emitting diodes (LEDs). The potential effects of LEDs on pupils have hardly been investigated. The purpose of the study was a comparison of LEDs and incandescent light on pupils' behaviour under practical conditions in three schools with a total of six classes. While the results on alertness and concentration were heterogeneous, memory and creativity performance were reduced by LED lighting. There is a substantial lack of knowledge of the potential effects of LEDs on pupils' behaviour. With regard to students' behaviour, the planned ban on incandescent and halogen lighting by the EU is untimely and missing a scientific basis.

ZUSAMMENFASSUNG. Die Europäische Union hat mehrere Maßnahmen ergriffen, um die Produktion und den Handel mit Glüh- und Halogenlampen in naher Zukunft zu verbieten, da der Energieverbrauch höher ist als bei Leuchtdioden (LEDs). Die möglichen Auswirkungen von LED auf das Verhalten von Schülern sind kaum untersucht worden. Ziel der Studie war ein Vergleich von LED und Glühlampen- bzw. Halogenlicht über das Verhalten von Schülern unter praktischen Bedingungen in drei Schulen mit insgesamt sechs Klassen. Während die Ergebnisse hinsichtlich Wachsamkeit und Konzentration heterogen waren, wurde die Gedächtnis- und Kreativitätsleistung durch LED-Beleuchtung reduziert. Es besteht ein erhebliches Wissensdefizit über die möglichen Auswirkungen von LEDs auf das Verhalten der Schüler. Im Hinblick auf Verhaltenseffekte von Schulkindern ist das geplante Verbot von Glüh- und Halogenlampen durch die EU verfrüht und ohne wissenschaftliche Grundlage.

Keywords: Classroom lighting, halogen, LED, student behaviour

Introduction

Interior lighting is an important component of the physical learning environment in schools. Currently, possible ways of using artificial light are rapidly changing. So-called light-emitting diodes (LEDs) are increasingly being utilised and are replacing the incandescent light bulbs and fluorescent lights that are currently in use. LEDs are attractive because of their low energy consumption and versatility. The European Commission (EC) has taken several steps to ban the production and trade of incandescent lamps, and

it plans to do so with the lighting features in the near future because energy consumption is higher for incandescent lamps than LEDs (EC, 2016).

Different types of light bulbs vary technically; they also produce different kinds of light. LEDs emit a higher proportion of blue light and a lower proportion of red and infrared light than halogen and incandescent bulbs. This difference between LED and halogen/incandescent light does not fundamentally change, even with a warm light colour. Halogen and incandescent bulbs exhibit the most continuous and sun-like spectra. Many classrooms are equipped with fluorescent lighting tubes. The light from these lamps has a discontinuous spectrum, which usually has peaks in the blue, green and yellow wavelength ranges.

The effects of the high-energy shortwave blue light in LEDs are increasingly being debated in connection with the frequent use of monitors and smartphones. They have been medically shown to produce sleep disorders (Gringas et al., 2015; Yang et al., 2018) and retinal damage risk (Behar-Cohen et al., 2013; Ratnayake et al., 2018; Tosini et al., 2016). A number of studies reported performance improvements in night shift workers when working in a brightly lit environment (Boyce et al., 1997; Campbell & Dawson, 1990; Figuerio et al., 2001; Mills et al., 2007). Other studies point to higher achievements of office workers in blue-enriched white light environments (Viola et al., 2008). This is attributed to the effects of the short-wave (blue) light component (Cajochen et al., 2005; Chellappa et al., 2011; Lockley et al., 2006).

Blue-enriched lighting is associated with higher alertness (Alkozei et al., 2017; Viola et al., 2008). For higher alertness, in addition to visual effects, non-visual effects have been found to have an effect on the hormonal system. However, there are also indications that physiological stimulation using blue-enriched lighting does not always lead to greater alertness (Rodriguez-Morilla et al., 2017).

Few studies have investigated the effect of blue-enriched lighting on students (Keis et al., 2014; Pulay & Williamson, 2018). In both studies, fluorescent light was used as the standard. No previous studies have compared LED lighting against incandescent or halogen lighting in school environments.

A series of studies investigated the light conditions on the behaviour of students at constant illuminants, namely fluorescent or incandescent lighting. Baron et al. (1992) simulated office work with students under different lighting conditions. The students' communication skills improved and their performance on tasks that required social skills was better in environments with warmer and darker light (3000 Kelvin (K), 150 lux (lx)). In the study by Fleischer (2001), which simulated a laboratory work situation, communication and social behaviour also improved under warm white light. However, alertness was found to improve in daylight white light. Küller and Lindsten (1992) came to a similar conclusion in their study with primary school pupils; they reported increased alertness and concentration in daylight white light and increased communication in warm white light. Steidle and Werth (2013) conducted a variety of experiments to investigate the effect of lighting conditions on the creativity of students. In a dim room (150 lx), the overall creativity was higher, while in a bright room (1500 lx) analytical thinking was improved.

Shamsul et al. (2013) investigated the effects of the correlated colour temperature (3,000 K, 4,000 K or 6,500 K) on task performance and alertness among students. The authors concluded that 4,000 K or 6,500 K light were more beneficial for alertness level and academic activities for both computer-based and paper-based activities.

Werth et al. (2013) identified a considerable need for research into the influence of light and lighting on perception and behaviour towards other persons. According to Chok and Suk (2016), there is a lack of interior lighting studies in learning environments, especially with a younger population.

The study by Slepian et al. (2010) is the only one that compares incandescent lighting with cold fluorescent light to determine their effect on problem solving. That study reported that insight problems were solved better under incandescent lighting than cold fluorescent lighting. In the experiment by Geier (2016) with adults who were trained in self-observation, a significantly better sense of well-being was found under halogen light than under LED light.

In the two available studies, which examined LED effects on children and adolescents (Keis et al., 2014; Pulay & Williamson, 2018), the focus was on parameters of alertness, concentration and cognitive processing. Social skills or creativity have not been considered.

In three experiments with students in a total of six classes in three schools, we investigated whether the conversion from incandescent or halogen lighting to LED lighting changed the students' behaviours. For all three of the experiments, the colour temperature and light intensity were as similar as possible. The aim was to consider a broad spectrum of abilities of children and adolescents. Based on the literature (Keis et al., 2014; Küller & Lindsten, 1992; Steidle & Werth, 2013), the skills of alertness/concentration, memory and creativity were selected.

The guiding questions of the three sub-studies were: Do the pupils behave differently under LED and incandescent or halogen light (Preparatory Study 1)? Is it possible to repeat the effects of the first study with students in more classes (Preparatory Study 2)? Can the results of both preparatory studies be repeated in an extended experimental design (Study 3)? It was assumed that blue-enriched lighting (LED) promoted alertness and concentration. There were no assumptions regarding memory and creativity skills.

To avoid any teaching disturbances, the testing tasks were designed to be similar to typical class exercises. The exercises and the experimental design were discussed with the teachers involved in the study.

Alertness and concentration were checked via the error rates in dictations and in arithmetic. Memory was tested on memorized content when copying from the blackboard, from text sheets and from teacher narratives. Creativity was measured by the ability to paint pictures. The spectral distribution and design of halogen and incandescent lamps are very similar. In the experiment, therefore, both are considered as one variant.

Study 1 (preparatory study)

Design

During a two-week period in spring 2016, the lighting regime (nine pendant luminaires) in the classroom was changed in the following order: LED, halogen, and halogen and LED light. Each lighting regime lasted one day. The halogen lighting represented the current situation (Osram Halolux Ceram® 150 W, E 27, 2870 lumens (lm), 2900 K, colour rendering index (CRI/Ra) 100) (Osram 2018a), while the LED lighting represented the future situation (Luxwerke x.course 35 W, 3650 lm, 2700 K, CRI/Ra >90). The influence of sunlight (daylight) was reduced by the use of curtains during the experiments.

Participants

Twenty-seven students in a fifth-grade class (ages 11 and 12) in a private integrated comprehensive school in southwestern Germany participated in Study 1. Only 21 students could be included in the evaluation due to absence on one date.

Exercises

For each of the four exercise sessions, a dictation was carried out. The text length of each dictation ranged between 30 and 50 words. For the first two sessions, an open retelling was conducted (66 or 106 words). During the last two sessions, the students had to copy text that was written on the blackboard (332 or 154 words). The orthographical mistakes were measured for all the exercises. The copied text addressed the students' direct speech. The direct speech portion of the exercises included five to seven verbs, such as reported, said, explained, asked, etc. The correct use of the verbs was examined. The error rate in the dictations was assigned to the alertness and concentration capability, while the error rate when transferring text from the table was associated to the memory capability.

Results and Discussion

The dictation was normalised to 100 words. The average word error rate was 4.40 (standard deviation (SD) 4.58) under LED light and 1.95 (SD 3.70) under halogen light. The pairwise t-test showed statistically significant differences between the two types of lighting ($p = 0.002$).

In the open retelling and text copying exercises, more mistakes occurred under LED lighting. For the open retelling normalised to 100 words, 4.61 (SD 2.83) mistakes occurred under LED lighting in comparison to 3.90 (SD 1.94) mistakes under incandescent lighting ($p = 0.319$). In the text copying exercise normalised to 100 words, 3.6 (SD 2.28) mistakes occurred under LED lighting and 0.8 (SD 1.20) mistakes occurred under incandescent lighting ($p < 0.0001$).

In the text copying exercise under LED lighting, 47% of the 21 students applied the seven verbs correctly, while 53% were confused about at least one verb. Under the incandescent light, 100% of the students used the five verbs correctly ($p < 0.0001$).

Study 2 (preparatory study)

Design

In February 2017, the lighting regime (nine pendant luminaires) was altered in three classrooms. The experiments were conducted for one week under the current lighting regime (incandescent light bulbs Osram 100 W, E 27, 2700 K, 1340 lm, CRI/Ra 100) (Osram 2018b). In the second week, comparable LED lighting (Philips warm white 13 W, E 27, 2200-2700 K, 1521 lm, CRI/Ra 80) (Philips 2018a) was used. One classroom started with LED lighting, while two classrooms started with incandescent lighting.

Participants

Students of three classes (Class 3, ages 9 and 10: n= 34; Class 5, ages 11 and 12: n=22, Class 7, ages 13 and 14: n=26) in a private integrated comprehensive school in the southern Germany participated in Study 2.

Exercises

In Class 3, dictation, mental calculation and drawing of pictures were examined. For the dictation, the teacher recited four short sentences. The mental calculation consisted of eight exercises with monadic or binary numbers. Pictures were drawn twice; in the first case the students were allowed to draw any image they wanted (free-style); in the second case, the theme for the drawing was animals. In Class 5, dictation and text copying were examined. In Class 7 dictation, mental calculation and open retelling were examined.

Mistakes from the text copying, dictation and mental calculation exercises were measured. The text length of the open retelling was counted. The images were assessed and coded by an experienced teacher from the Netherlands using the following parameters: size, colourfulness, harmony, forming capacity, devotion and unity.

The error rate in writing and mental calculation was associated to the alertness and concentration capability. The text length of the open retelling was associated to the memory capability. The ability to draw was related to the skill to be creative.

Results and Discussion

Class 3

For dictation and mental calculation, no differences were observed between the two types of lighting regimes (dictation: 8.28 mistakes (SD 4.77) [LED] per 100 words; 9.38 mistakes (SD 4.09) [incandescent]

per 100 words, p = 0.065; mental calculation: 0.41 mistakes (SD 0.76) [LED], 0.44 mistakes (SD 0.80] [incandescent], p= .879). The students in classroom 3 painted two free-style pictures. In both cases, the pictures created under incandescent lighting were evaluated better, with significant differences in three of the five and five of the five painting capacity criteria (see Table 1). The total value of the single criteria shows significant differences, too. Figures 1 to 3 show examples of the pictures of three students painted under different lighting conditions.

Table 1: Evaluation of the students' drawing capacity. Descriptive statistics. Type of criteria (mean value %) and p-values (bold type means significant results); n=34 students in classroom 3 (INC = incandescent or halogen light).

Pictures with a free-style theme						
	Size	colour-fulness	harmony	forming capacity	unity /integration	Total value all criteria
LED	72.0 (41.6)	30.2 (43.4)	50.7 (44.6)	30.9 (39.9)	33.8 (40.8)	43.5 (41.3)
INC	90.4 (26.8)	76.5 (40.3)	62.5 (43.6)	64.7 (42.2)	52.9 (43,4)	69.4 (44.9)
p-value	**0.039**	**<0.0001**	0.307	**0.001**	0.058	**<0.0001**

Pictures with the animal theme						
	devotion	unity	forming capacity	firmness	fullness	Total value all criteria
LED	23.5 (43.1)	35.3 (48.5)	38.2 (49.3)	26.5 (44.8)	23.5 (43.1)	29.4 (45.7)
INC	55.9 (50.0)	58.8 (50.0)	64.7 (48.5)	61.8 (49.3)	64.7 (48.5)	61.2 (48.9)
p-value	**0.009**	**0.030**	**0.048**	**0.005**	**<0.0001**	**<0.0001**

Class 5

In class 5, the mistakes under LED lighting were 172% (copy text: 5.16 mistakes/100 words (SD 3.45) [LED], 2.84 mistakes/100 words (SD 2.59) [incandescent], p=.01) and 114% (dictation: 17.18 mistakes/100 words (11.24) [LED], 15.14 mistakes/100 words (SD 11.30) [incandescent], p= .26) in comparison to incandescent lighting (100%).

Class 7

While the students from class 7 performed *better* under LED lighting in terms of dictation mistakes (12.21 mistakes (SD 11.95) [LED], 26.13 mistakes (SD 20.58) [incandescent], p= .0003), there were no differences in the errors in mental calculation (2.46 mistakes (SD 2.67) [LED], 2.64 mistakes (SD 2.26) [incandescent], p= .67). The text length of the open retelling was longer under incandescent lighting (10.54 (SD 3.75) [LED], 17.04 (SD 7.99) [incandescent], p= .0004).

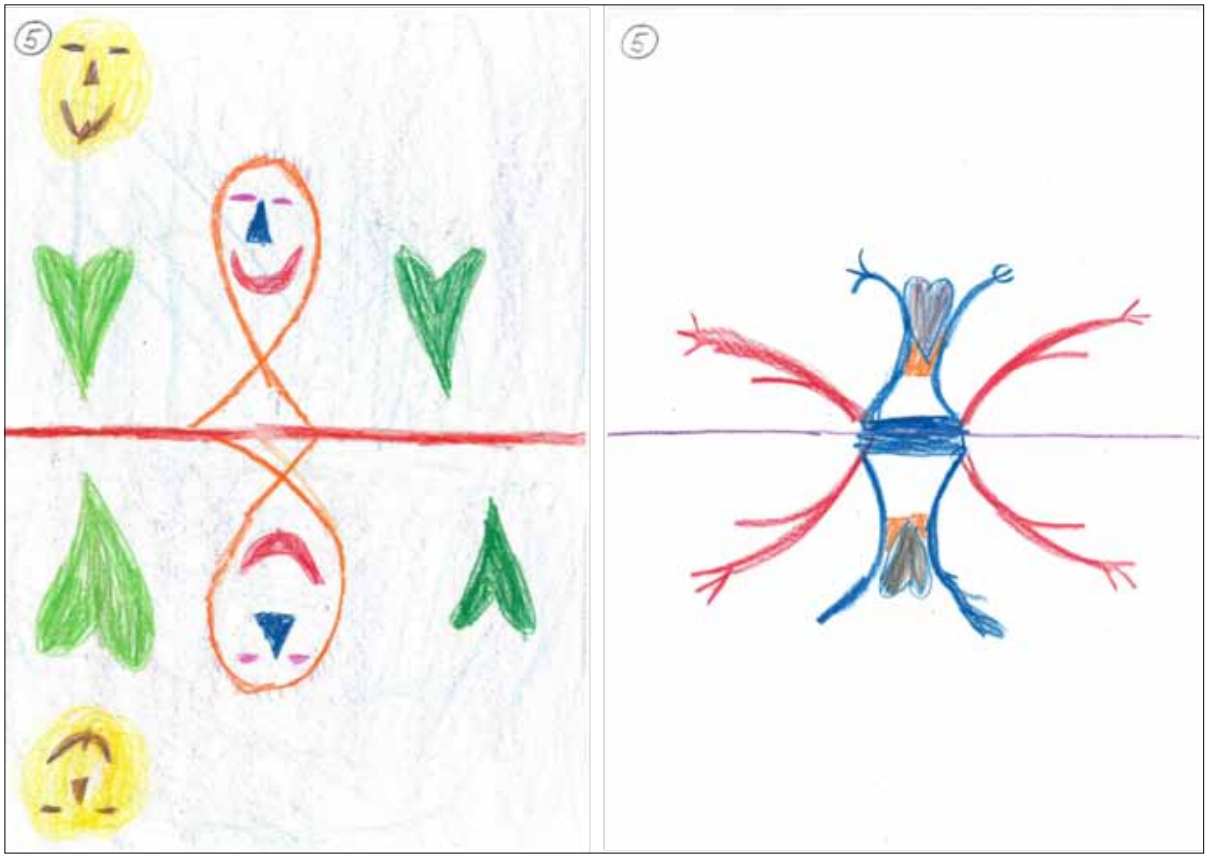


Figure 1: Example of one pupil of Class 3 painting under incandescent (left) and LED (right) light.

Figure 2: Example of one pupil of Class 3 painting under incandescent (left) and LED (right) light.

Figure 3: Example of one pupil of Class 3 painting under incandescent (left) and LED (right) light.

Study 3

Design

The experiments in study 3 were conducted over a four-week period in February and March 2018. For every week, the lighting regime in the classroom (six pendant luminaires) was altered in the following order: LED, halogen, LED and halogen (Classroom 4) and halogen, LED, halogen and LED (Classroom 6).

Class 4 used the same lighting that was used in Study 1: Osram Halolux Ceram® (150 W, E 27, 2870 lm, 2900 K, CRI Ra 100) (Osram 2018a) for halogen and Luxwerke x.course (35 W, 3650 lm, 2700 K, CRI Ra >90) for LED. In Classroom 6 Osram halogen light bulbs (77 W, E 27, 2800 K, 1320 lm, CRI Ra 100) (Osram 2018c) and Philips LED light bulbs (warm white 11.5 W, E 27, 2700 K, 1521 lm, CRI Ra 80) (Philips 2018b) were used.

Participants

Students in two classrooms (Class 4, ages 10 and 11: n= 26; Class 6, ages 12 and 13: n=21) in a private integrated comprehensive school in the middle of Germany participated in Study 3. Only the results from students that were in attendance all four weeks were considered. Thus, the number of students was reduced from 26 to 21 (Classroom 4) and from 21 to 13 (Classroom 6).

Exercises

The exercises were conducted each week over the course of four weeks. The students in both classes had to describe a photo of a child. The following questions were asked: What do you see in the picture? How do the

children feel? Because most of the students did not answer the second question, only the answers to the first question were evaluated. The aim was to measure the students' visual recognition. In both classrooms, visual discrimination was examined using a image search test (with photos of a boat or a train).

Drawing capacity was evaluated by asking the students in both classrooms to create free-style paintings. An open retelling exercise was conducted in Class 4. The text length was counted and the most important topics were identified to measure the students' memory capacity. A text-copying exercise was carried out in Class 6. The students had to read three short stories, each containing four or five sentences, within five minutes. After receiving an acoustic signal from the teacher, the students had to turn the sheet around and write down the information they remembered within five minutes. Text length and mistakes were measured.

As in the preliminary studies, the results of the error rate in writing and arithmetic were assigned to alertness and concentration skills. The length of the text and the content of retellings and transcriptions were assigned to the skill of memory. The ability to draw was related to the skill creativity. Only in this study was the ability of visual recognition tested by describing a photo and a image search test.

Lighting conditions

The lighting conditions in both classrooms were very similar; therefore, only Classroom 4 is described in more detail.

The lighting conditions were impacted during the day by daylight from the windows on the northwest side of the room. Since the position of each student was essential, the measurement took place at desks with a height of 0.75 m, which were arranged in four rows in the classroom from the windows to the side wall. Additionally, the light density was measured at the blackboard in front of the classroom. Figure 4 presents the light intensity respectively illuminance of artificial light in Classroom 4.

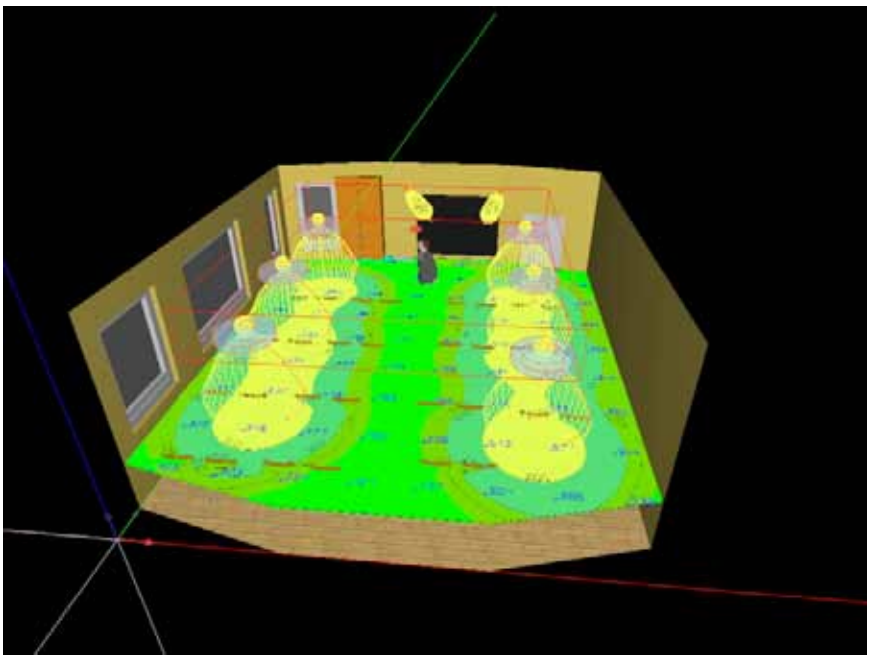
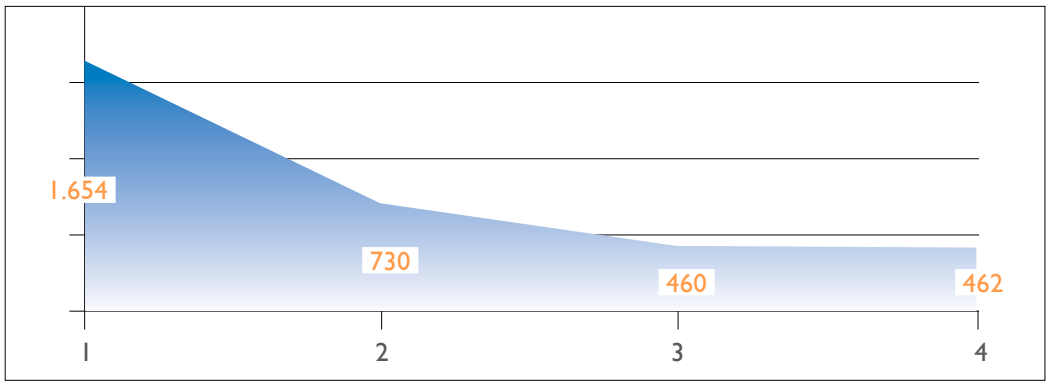


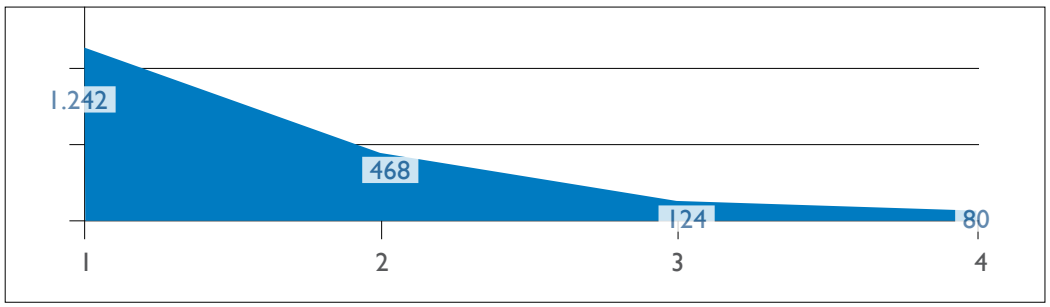
Figure 4: Illuminance at desk height of the artificial light in Classroom 4.

Figure 5 shows the average illuminances in the cross-direction for daylight and artificial light at 1 p.m. and 3 p.m., respectively. On a bright day at 3 p.m. the intensity of the daylight on the desks increases from 1242 lux at the window side of the room to 80 lux at the wall side. The total average illuminance of the daylight was 505 lux. At 1 p.m. the average values were 1099 lux at the window side of the room to 116 lux at the wall side, respectively with a mean value of 490.

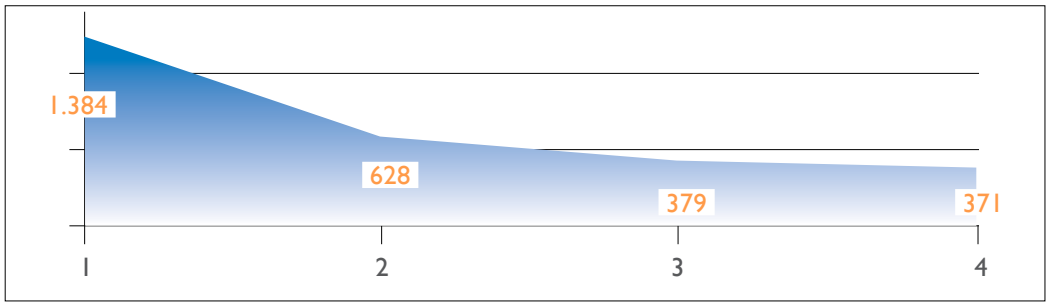
Class 4: LED + daylight at 3 p.m. Lighting intensity (Lux). Left (1) values from the desks near the windows, right (4) values from the desks near the wall.



Class 4: Daylight at 3 p.m. Lighting intensity (Lux). Left (1) values from the desks near the windows, right (4) values from the desks near the wall.



Class 4: Halogen + daylight at 1 p.m. Lighting intensity (Lux). Left (1) values from the desks near the windows, right (4) values from the desks near the wall.



Class 4: Daylight at 1 p.m. Lighting intensity (Lux). Left (1) values from the desks near the windows, right (4) values from the desks near the wall.

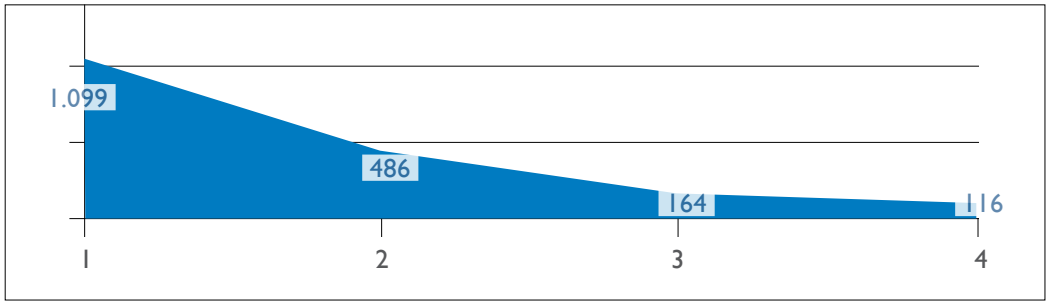


Figure 5: Mean illuminance in the cross direction for daylight and artificial light.

The largest difference between maximum and minimum illuminance was 1:14 and 1:20 in the cross-direction at 1 p.m. and 3 p.m., respectively. At 3 p.m. the illuminance of LED lighting and daylight together was 1654 lux for the window side of the room and 462 lux for the wall side. The total average illuminance of the daylight and LED lighting was 851 lux. At 1 p.m. the average values were 1384 lux, 371 lux and 712 lux, respectively. When artificial light was used, the largest difference between maximum and minimum light intensity improved up to 1:5 at 3 p.m. and 1 p.m.

The yield of artificial lighting results from the reduction of the mean illuminance of daylight and artificial light and the mean of the daylight. The illuminance value for the LED light component is 346 lux, which represents 41% of the total light. For the halogen light component, the illumination value is 222 lux, which is 31% of the total light.

The luminance of the front wall at the teacher's desk was measured at four points at a height of approximately 1.60 m in daylight as well as in artificial lighting. The blackboard in the middle of this wall creates the contrast. Two parabolic reflector (PAR) halogen spotlights (Radium PAR 38 FL, 100 W, 900 lm, E 27, 2900 K, CRI/Ra 100) directed at the wall, as well as the daylight, further determine the contrast values that were found. At 1 p.m., the mean luminance increased by 29% using all halogen lighting to a mean value of 53 candela/m2; at 3 p.m. the approximately 37% lower daylight component increased by 87% with both the LED and PAR halogen lighting to a mean value of 48 candela/m2.

The light measurement reveals the large differences of illuminance in the classroom. Obviously, the measurement of the potential effects of artificial light was impacted by daylight. However, the classrooms did not offer the possibility of dimming the artificial lighting or obscuring the amount of daylight that entered the room.

In Classroom 6, the position of each student changed during the experiment; however, the seating positions of the students in Classroom 4 did not change. In order to test the impact of daylight on all the exercises, the students in Classroom 4 sitting near the windows and far from the windows were considered separately.

Statistical Analysis

The results of the exercises were evaluated using analysis of variance (ANOVA) and Tukey's honest significant difference (HSD) to determine if there were statistically significant differences between the variables. All data analyses were carried out using XLStat statistical software.

Results and Discussion

Class 4

Visual recognition

The number of observations was counted. No significant differences were found between both lighting regimes (mean values: 5.38 (SD 2.19) [halogen], LED 5.76 (SD 2.06) [LED], p = .223). However, the students sitting far from the windows (n=8) performed better under LED lighting (mean values: 5.16 (SD 2.12) [halogen], 6.38 (SD 1.90) [LED], p = .002), while no significant differences were observed for the students sitting near the windows (mean values: 5.62 (SD 2.39) [halogen], 5.06 (SD 2.11) [LED], p = .12). This indicates that LED lighting had a positive effect on visual recognition and provided better visual discrimination for the students sitting far from the windows than the halogen lighting regime.

Visual discrimination

The number of observed meanderings between the two photos was measured. The type of lighting regime had no effect on visual discrimination for the entire classroom (mean values: 7.86 (SD 0.80) [halogen], 7.60 (SD 1.58) [LED], p = .49) or for the students sitting near the windows or far from the windows.

Open retelling

No significant differences were found between the halogen and LED lighting regimes. Text length (mean values: 103 (SD 12.11) words [halogen], 97 words (SD 12.11) [LED], p = .237) and the main topics (mean values: 10.0 (SD 3.83) [halogen], 9.4 (SD 3.46) [LED], p = .167 were measured. Moreover, no differences were observed for the students sitting near the windows and the students sitting far from the windows.

Drawing capacity

Four drawing capacity criteria were determined: strength, harmony, colourfulness and fullness. Additionally, the total value of all four criteria was calculated.

Of the four criteria, no differences between the lighting regimes were observed for strength (mean values: 45.1% [halogen], LED 48.0% [LED], p = .379), harmony (mean values: 49.5 % [halogen], LED 45.1 % [LED], p = .180) and colourfulness (mean values: 48.0% [halogen], 42.0% [LED], p = .201). However, significant differences between the lighting regimes were found for fullness. Pictures drawn under halogen light had greater fullness (mean values: 57.9% [halogen], 46.1% [LED], p = .007). In half of the students sitting far from the windows, the difference was greater (mean values: 66.0% (SD 12.64) [halogen], 47.7 % (SD 15.41) [LED], p = .002).

The summary of all five drawing capacity criteria demonstrates the significant effects of the lighting regime (mean values: 50.1% [halogen], 45.3% [LED], p = .014). Again, the effect is enhanced in the group of students sitting far from the windows (mean values: 53.3% (SD 15.80) [halogen], 45.3% (SD 13.31) [LED], p = .003). No significant effect was found for the students sitting near the windows (mean values: 47.3% (SD 14.06) [halogen], 45.3% (SD 15.04) [LED], p = .430). This indicates that halogen lighting has a positive effect on drawing capacity and this lighting regime provides better discrimination for the students sitting far from the windows.

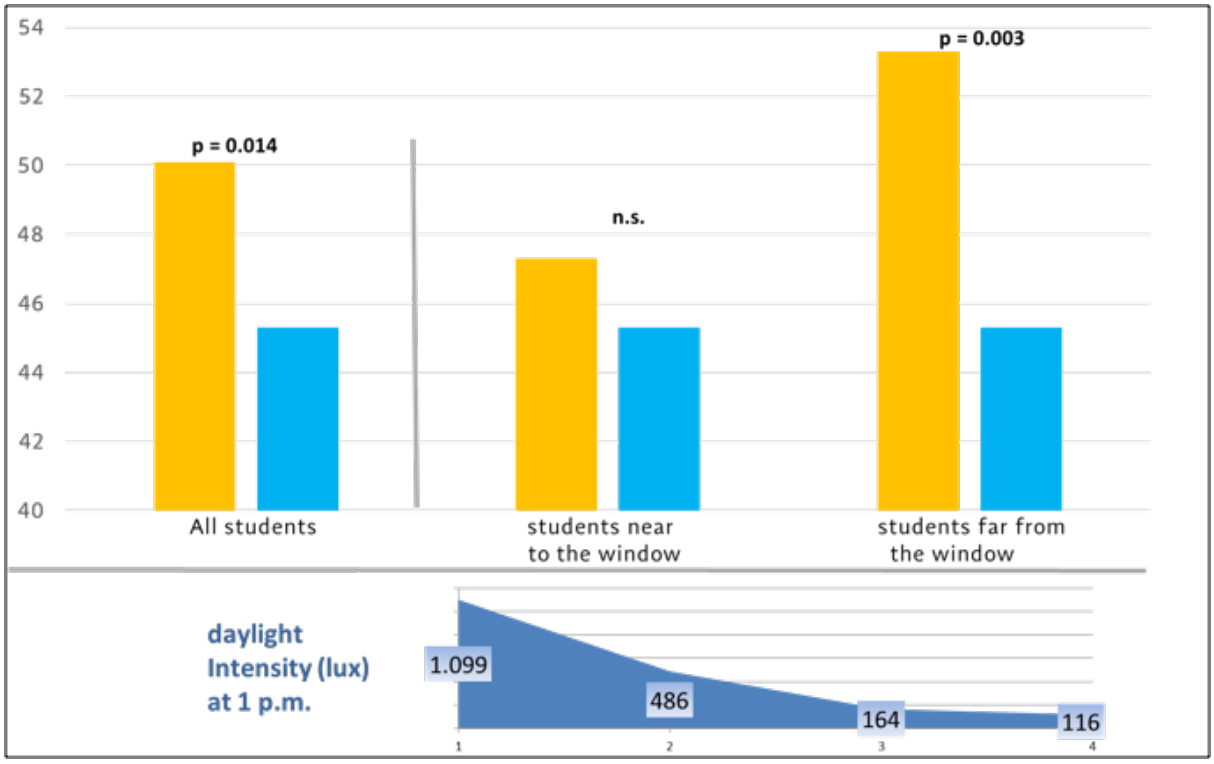


Figure 6: Effect of artificial light on the ability of children in 4th grade to paint. Total value of all criteria (characteristic value in percent). Influence of daylight. Lower part of the figure: Mean light intensities in the cross-direction for daylight.

Table 2: Evaluation of drawing capacity. Descriptive statistic. Type of criteria (mean value %, SD in brackets) and p-values (bold type means significant results), (INC = incandescent or halogen light).

Classroom 4 (n=21)					
	strength	harmony	colourfulness	fullness	Total value of all criteria
LED	48.1 (14.16)	45.1 (9.83)	42.0 (17.49)	46.1 (14.45)	45.3 (14.15)
INC	45.0 (13.43)	49.5 (14.04)	48.0 (15.76)	57.9 (16.14)	50.1 (15.39)
p-value	0.379	0.180	0.201	**0.007**	**0.014**
Classroom 6 (n=13)					
	strength	harmony	colourfulness	fullness	Total value of all criteria
LED	48.8	49.1	50.0	68.0	53.5
INC	48.4	55.0	50.7	73.6	56.9
p-value	0.737	0.358	0.891	0.214	0.167

Classr 6

Visual recognition

No significant differences between the lighting regimes were found (mean values: 5.79 incandescent], 5.58 [LED], p = .586).

Text copying

The length of the text, rate of mistakes and main topics were measured. Under incandescent lighting the students wrote significantly longer texts (mean value: 82.5 words [incandescent], 66.1 words [LED], p = .002). The rate of mistakes did not differ between the two lighting regimes (mean value of mistakes/100 words: 9.54 [incandescent], 9.95 [LED], p = .563). For the criterion, main topics, the students were tended to perform better under incandescent light (mean value: 16.9 [incandescent], 14.9 [LED], p = .052).

Drawing capacity

Four drawing capacity criteria were determined: strength, harmony, colourfulness and fullness. Additionally, the total value of the five criteria was calculated. No significant differences in drawing capacity were found for the four criteria or the total value of the five criteria (see Table 2), even if the rating under halogen lighting is slightly higher (e.g. total value of the five criteria 6.4%).

General Discussion

Our study aimed to measure the effects of LED lighting and incandescent respectively halogen lighting on different students' skills under practical conditions. The illuminance and colour temperature of the lighting were similar in each case. The LED illuminance was slightly higher than the incandescent brightness (see Figure 1). LED light has more blue light and less red and infrared light in its spectrum than incandescent

or halogen light. Furthermore, halogen and incandescent light have no radio frequency, less flicker and a different source temperature than LED.

In many cases, lighting has an influence on students' performance. Table 3 presents a summary of the results of the study's experiments.

Table 3: Effect of lighting on students' behaviour. Which lighting regime performed better? Summary of the results of the three studies.

Skills	***Alertness, concentration***	***Memory***	***Creativity***	***Visual recognition***
Exercises	Mistakes in writing and calculation	Text copying and open retelling (completeness, text length)	Drawing of pictures	Written scene description, picture search
Study 1 class 5	INC, INC, n.s.	INC	x	x
Study 2 class 3	n.s., n.s.	x	INC	x
class 5	INC, n.s.	x	x	x
class 7	LED, n.s.	INC	x	x
Study 3 class 4	x	n.s., n.s.	INC*	LED**, n.s.
class 6	n.s.	INC, n.s.***	n.s.	n.s.

x = not detected, n.s. = not significant, INC = incandescent or halogen light significantly better, LED = LED light significantly better. Each item represents the results of one exercise.
*Enhanced differences in the student group with low daylight influence
**Significant differences only in the student group with low daylight influence
***Trends towards better INC results (p=0.052)

In those exercises that require more alertness and concentration, the results were heterogeneous. The type of lighting was found to have no significant effect for half of the exercises. In one case, in Class 7 (students ages 13 and 14), and for one exercise (mistakes in dictation), students made fewer mistakes under LED light. In the two cases with students in Class 5 (ages 11 and 12) (mistakes in dictation and copy text), the performance was improved under incandescent light.

The outcome is different with the tasks that are associated with memory. In three out of four classes, the students' memory was better under incandescent or halogen lighting. There were no differences in one class (Class 4, Study 3).

This result is similar to the finding observed for creativity, which was evaluated by having the students paint pictures. In two of the three classes, the pictures painted under incandescent or halogen lighting were better than the pictures painted under LED lighting. In one class (Class 6, Study 3), the differences were not significant.

The classification of the exercises into the skills of memory or creativity is not always unambiguous. For example, it is also possible to classify the text length of an open retelling under creativity instead of under

memory. However, the impact of the type of lighting would change little because the results were found to be similar for both skills.

Visual recognition was only measured in two classes (Classes 4 and 6, Study 3). In Class 4, the students' visual recognition was better under LED lighting than halogen lighting; in Class 6, no difference was found.

Looking at the overall results, both types of lighting seem to address children's abilities differently. LED light shows limited advantages in tasks that are more related to concentration and alertness. Tasks that rather require memory and creativity skills were mostly better solved under incandescent or halogen light. Two studies were identified comparing LEDs with another light source under school conditions (Keis et al., 2014; Pulay & Williamson, 2018). In both studies, concentration and alertness were improved by LED light.

Keis et al. (2014) studied 17 to 21-year-old, mostly male secondary and vocational school students during winter to determine whether very bright white LED light in the early morning improves cognitive performance. The comparison lighting was fluorescent light. That study found that cognitive processing and concentration improved under LEDs. The blue-enriched lighting had no effect on short-term encoding and retrieval of memories. The students preferred the standard lighting, namely fluorescent light. However, Keis et al. (2014) concluded that the results could not be generalised to older or younger people.

In the study by Pulay and Williamson (2018), the influence of LED and fluorescent light with similar colour temperature on the behaviour of 23 students, aged 3–4 years, was compared. The childrens's involvement was measured using a snapshot observational method as an expression of alertness. The LED light increased the engagement of the children.

The results of Keis et al. (2014) correspond with results on the office environment (Viola et al., 2008). However, Werth and Steidle (2013) pointed out with regard to the factors of brightness and colour temperature that at high brightness and low colour temperature, not all cognitive tasks are optimally solved, but for learning and creativity tasks warmer light at lower brightness is more advantageous. Baron et al. (1992) and Fleischer (2001) came to similar conclusions.

The literature review shows that lighting intensity affects human capabilities in different ways. This supports the assumption that LED light improves only some skills.

Some of the findings reported in the literature indicate that LED light has the same effect as cold bright light, namely that it enhances alertness and concentration. In both of the other studies on the influence of LEDs on students' behaviour (Keis et al., 2014; Pulay & Williamson, 2018), there is no testing of creativity, social competence or communication. Our own results point to disadvantages of LED light on memory and creativity.

The introduction of LED lighting in classrooms leads to a higher (short-wave) blue light component and a lower red light component, and often the brightness is increased. On the basis of the findings reported in the current body of literature and the present study's results, it can be assumed that LED light will lead to an increase in alertness and concentration, and a reduction in memory, creativity, social competence and related tasks. Depending on the brightness and colour temperature, the effect would be stronger or weaker.

The literature search shows a widespread lack of studies on the effects of LED lighting on students. Apart from our study, the influence of LED light on students between the ages of 6 and 16 has not yet been tested. Moreover, no study has compared up to now the impact of LED lighting and halogen (and incandescent) lighting on children.

The limitations of our study are the tests applied and the test design. The tests we used were not standardized. The children should not be faced with unfamiliar questionnaires. Instead, together with the teachers involved, tasks were developed that corresponded to the usual tasks, or tasks were applied that were used in class anyway. In this way, the tests should not lead to a disruption of teaching. The overall study consists of three individual studies with their own test design. Therefore, a statistical comparison of the

results of all partial studies is not possible. The first two studies are preliminary studies, while in the last all tests were replicated. However, the results of the three sub-studies are confirmatory.

For a complete assessment of the effects of blue-enriched lighting and other features of LEDs on children, factors such as social behaviour and creativity should be evaluated, not just cognitive performance. Until those studies are available, there is no scientific impact assessment justifying a ban on using lamps other than LEDs. This ban is imminent; therefore, there is an urgent need to discuss this topic.

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Von der Waldorfkrippe in den Waldorfkindergarten

Ergebnisse einer quantitativen empirischen Untersuchung zu den Faktoren gelingender Übergänge

Philipp Gelitz

ZUSAMMENFASSUNG: In Deutschland ist in den letzten zehn Jahren eine starke Zunahme von KiTa-Plätzen für unter-dreijährige Kinder zu verzeichnen. Außerdem ist ein deutliches Forschungsdesiderat in Bezug auf die Bildungstransition Krippe/Kindergarten zu konstatieren, da hier bislang nur eine empirische Untersuchung vorzufinden ist. Darüber hinaus sind kaum Studien zur vorschulischen Waldorfpädagogik ausfindig zu machen. Vor diesem Hintergrund wandte sich eine Master-Thesis an der Alanus Hochschule Alfter mit statistischen Methoden den Faktoren zu, die im Erlebnis der beteiligten Fachkräfte zu einem gelingenden Übergang von der Waldorfkrippe in den Waldorfkindergarten beitragen. Es konnten dabei mehrere Faktoren identifiziert werden, die das Erlebnis von der Höhe der Übergangsqualität signifikant steigern, wobei sich das Miteinander der beteiligten Erwachsenen insgesamt als hervorstechendste Gelingensbedingung erwies. Ebenso spielten das Belastungserlebnis der Fachkräfte sowie das individuelle Eingehen auf das einzelne Kind übergeordnete Rollen. Es lassen sich daraus direkte Handlungsempfehlungen für die elementarpädagogische Praxis in Waldorf-Kitas ableiten.

Schlüsselwörter: Transition, Waldorfkrippe, Waldorfkindergarten, statistische Methoden

ABSTRACT. In Germany, there has been a sharp increase in childcare places for children under the age of three in the last ten years. In addition, a clear research desideratum regarding the transition from day nursery (under 3) to kindergarten (over 3) is to be stated, because so far only one empirical study can be determined. Furthermore, hardly any studies on pre-school Waldorf education can be found. Against this background, a master thesis at Alanus University Alfter used statistical methods to reveal factors that contribute to a successful crossing from a Waldorf day nursery to a Waldorf kindergarten in the experience of the involved professionals. It was possible to identify several factors that significantly enhance the quality experience of the transition: the interaction of the involved adults, both professionals and parents, proved to be the most outstanding condition overall. Likewise, the stress experience of the professionals as well as the individual approach to each child played a major role. Thus, direct recommendations for the pedagogical practice in Waldorf day care centers can be derived.

Keywords: Transition, Waldorf early childhood education, statistical methods

Einleitung

Der Master-Studiengang *Pädagogische Praxisforschung* an der Alanus Hochschule in Alfter ist besonders auf die Vermittlung sozialwissenschaftlicher Forschungsmethoden ausgerichtet und mündet für die

abschließende Master-Thesis in der Regel in eine empirische Untersuchung eines pädagogischen Praxisfeldes. In diesem Zusammenhang entstanden auch im Jahr 2018 wieder mehrere empirische Studien, die durch ihre Forschungsfragen und methodischen Ansätze in direkte Praxisempfehlungen mündeten. Eine dieser Arbeiten wird hier nun mit ihrer Zielsetzung, ihren theoretischen Bezügen, ihrem Forschungsdesign sowie ihren Befunden und daraus abzuleitenden Empfehlungen dargestellt. Ihr Titel: „Von der Waldorfkrippe in den Waldorfkindergarten. Quantitative Studie zu den Faktoren eines gelingenden Übergangs".

Ausgehend von einer erstaunlichen Forschungslücke in Bezug auf die Transition Krippe/Kindergarten (vgl. Griebel & Niesel, 2017, S. 110; Jung, 2014, S. 66), einem massiven Ausbau frühkindlicher Betreuungsangebote in den vergangenen zehn Jahren in Deutschland (Statistisches Bundesamt, 2012; Statistisches Bundesamt, 2017) sowie einer fast nicht vorhandenen empirischen Erforschung der vorschulischen Waldorfpädagogik (vgl. Riethmüller, 2016) lautete das Ziel der Erhebung, statistisch signifikante Faktoren des Gelingens des vielfach praktizierten Bildungsübergangs von der Waldorfkrippe in den Waldorfkindergarten zu ermitteln. Da auch die zunehmend öffentliche Debatte über pädagogische Qualität im Elementarbereich ohne eine nennenswerte Berücksichtigung der Thematik geführt wird (vgl. Viernickel et al., 2016), konnte dabei kaum auf vorangegangene Publikationen zum Thema zurückgegriffen werden.

Vor einer Darstellung des methodischen Aufbaus sowie der Befunde der Studie erfolgt nun zunächst ein knapper Umriss zweier theoretischer Bezüge der Untersuchung: Die *Transitionsforschung* sowie die *vorschulische Waldorfpädagogik*.

Transitionsforschung

In der Transitionsforschung, die sich auch unabhängig von pädagogischen Fragestellungen der Erforschung von Übergängen im Lebenslauf des Menschen zuwendet, wie beispielsweise dem Übergang vom Paar zur Elternschaft, Migration, Haftentlassung u.v.m. (vgl. Schröer et al., 2013), bilden im pädagogisch relevanten Bereich die eindeutigen Themenschwerpunkte die Übergänge von der Familie in die Institution (vgl. Griebel & Niesel, 2015) sowie vom Kindergarten in die Grundschule (vgl. Eckerth & Hanke, 2015; Oehlmann et al, 2011). In Bezug auf den Übergang Krippe/Kindergarten ist mit Edita Jungs Dissertation *Auf unvertrauten Pfaden* (Jung, 2014) lediglich eine empirische Studie zu finden.

Der Begriff *Transition* wird dabei hauptsächlich für institutionelle Übergange verwendet und bezeichnet somit Statuspassagen innerhalb des Bildungssystems. Zwar werden die Begriffe *Transition* und *Übergang* recht unterschiedlich gehandhabt und in der Literatur teilweise auch synonym verwendet (ebd., S. 49f.), es ist jedoch mit *Transition* immer ein als vertikal beschreibbarer Übergang von der Familie in eine Institution oder von einer Institution in eine nächste gemeint und nicht der als *horizontal* beschreibbare Übergang zwischen einzelnen pädagogischen Settings innerhalb eines Tages. Transitionen, die nicht jedes Kind zu bewältigen hat, wie beispielsweise ein Kindergartenwechsel wegen Umzug, werden in der Regel als *nichtnormativ* bezeichnet. Als *normativ* werden Transitionen bezeichnet, wenn sie vornehmlich gesellschaftlich intendierte, akzeptierte oder vorgeschriebene Aspekte beinhalten, wie z.B. die Transitionen Kindergarten/Schule, Familie/Kindergarten oder die hier in Rede stehende Transition Krippe/Kindergarten (vgl. Griebel & Niesel, 2017, S. 27f.; Jung, 2014, S. 59).

Vor dem Hintergrund verschiedener theoretischer Stränge, wie z.B. dem ökosystemischen Ansatz Urie Bronfenbrenners (Bronfenbrenner, 1981) oder der Betrachtung Sigrun-Heide Fillips zur Bewältigung von kritischen Lebensereignissen (Filipp, 1995), hat sich im deutschsprachigen Raum insgesamt ein Transitionsverständnis entwickelt, das in der Hauptsache die Bewältigung von vorliegenden Diskontinuitäten in den Blick nimmt. Nicht das Herstellen von Kontinuität oder fließenden Übergängen steht im Vordergrund, sondern die Bewältigung der Veränderung, d.h. die Transitionskompetenz der Akteure. Als vorherrschend kann hier zurzeit das IFP-Transitionsmodell von Wilfried Griebel und Renate Niesel gelten (Griebel & Niesel, 2017, S. 34-39). Sein dezidiert ko-konstruktiver Ansatz bündelt und erweitert die transitionstheoretischen Überlegungen mehrerer Autoren und hebt besonders hervor, dass die notwendige Bewältigung einer Diskontinuität und damit die Entwicklungsanforderung beim betreffenden Kind auf drei Ebenen vorliegt:

erstens auf der individuellen Ebene, zweitens auf der interaktionalen Ebene der Beziehungen sowie drittens auf der kontextuellen Ebene der Lebensumwelten (ebd., S. 37; Griebel & Niesel, o. J.).

Da Transitionen im Sinne eines Übertritts in einen neuen Lebensbereich durch Erstmaligkeit und Einmaligkeit gekennzeichnet sind, können die beteiligten pädagogischen Fachkräfte nicht als Akteure einer solchen Transition bezeichnet werden. Sie haben die Transition zu begleiten und zu moderieren. In einer Doppelrolle befinden sich demnach die Eltern: Sie haben sowohl eine Transition zu bewältigen, z.B. von Eltern eines Kleinkindes zuhause zu Kindergarteneltern in einer Institution, als auch die Transition ihres Kindes zu moderieren. Auch diese Doppelrolle muss von den pädagogischen Fachkräften begleitet werden (vgl. Griebel & Niesel, 2017, S. 105). Eine erfolgreiche Transitionsbewältigung ist somit auch als Kompetenz des involvierten sozialen Systems zu verstehen (ebd., S. 108).

Vorschulische Waldorfpädagogik

Die von Rudolf Steiner (1861-1925) begründete Waldorfpädagogik, die mit der Eröffnung der ersten Waldorfschule in Stuttgart 1919 ihren Anfang nahm, brachte in den ersten Jahren ihres Bestehens keine vorschulischen Institutionen hervor. Erst nach Steiners Tod begann Elisabeth von Grunelius 1926 in Stuttgart mit dem Aufbau einer ersten Waldorfkindergartengruppe (vgl. Lang, 2015, S. 18f.). Obwohl Steiner selbst der frühen Kindheit eine große Bedeutung beigemessen hat (vgl. Steiner, 2014), finden sich in seinen Schriften und Vorträgen nur vereinzelte Hinweise auf mögliche pädagogische Gestaltungen. Im Gegensatz zu detailliert aufgeführten und gut dokumentierten Grundsätzen und Handlungsempfehlungen für die Schulpraxis (vgl. Steiner, 1984; Steiner, 1990) erweist sich sein frühpädagogischer Impuls als vergleichsweise dünn (vgl. Steiner, 1989).

Umso bedeutender ist in diesem Zusammenhang die Sekundärliteratur zur waldorfpädagogischen Krippen- und Kindergartenerziehung. Die elementarpädagogische Praxis wurde in den Jahrzehnten nach Steiners Tod vor dem Hintergrund einiger seiner Kernaussagen erst entwickelt, sodass die Vorschulpädagogik in ihrer didaktischen Umsetzung von Anfang an stärker als die Schulpädagogik von vielen verschiedenen Impulsgebern und Protagonisten bestimmt war (vgl. Lang, 2015, S. 18-21). Handelte es sich dabei bis ins Ende des 20. Jahrhunderts hinein hauptsächlich um *Kindergarten*pädagogik, so öffnet sich die Waldorfpädagogik seit etwa 20 Jahren auch immer mehr der *Krippen*pädagogik (Glöckler, 2000; Krohmer, 2015). Empirische Studien oder erziehungswissenschaftliche Auseinandersetzungen zu Waldorfkindergärten oder -krippen sind allerdings kaum zu finden. Akademische Betrachtungen zu einer Waldorfpädagogik der frühen Kindheit können sich somit kaum auf Vorarbeiten stützen (vgl. Riethmüller, 2016).

In Bezug auf die Kindergartenpädagogik können aus der Literatur folgende Aspekte als wesentliche Merkmale eines Waldorfkindergartens identifiziert werden:

- Freies Spiel
- Das Prinzip *Vorbild und Nachahmung*
- Die hohe Bedeutung der Sinnesentwicklung
- Rhythmische Gestaltungen und Rituale

Darüber hinaus sind weitgehend anzutreffen: biologische Lebensmittel, Wachsmalblöcke, Stärkung des Kohärenzgefühls durch lebenspraktische Tätigkeiten, wenig explizite Wissensvermittlung, vollständiger Verzicht auf elektronische Medien, Singen, Reigenspiele, Verse, Puppenspiele, Eurythmie, Jahreszeitentisch sowie naturnahe Gestaltungen (vgl. Compani & Lang, 2015; Kardel et al., 2007; Saßmannshausen, 2015; Suggate, 2015).

In Bezug auf die Krippenpädagogik sind folgende Merkmale hervorstechend:

- Das Prinzip *Vorbild und Nachahmung*
- Autonome Bewegungsentwicklung

- Ungekünstelte Sprachentwicklung
- Das „Erwachen“ (Patzlaff et al., 2010, S. 45) des Denkens
- Sicherheit und Bindung
- Erkundung und Exploration (freies Spiel)
- Pflege der Sinne
- Erfahrung eigener Wirksamkeit
- Rhythmische Gestaltungen und Rituale

Ebenso sind auch in einer Waldorfkrippe weitgehend anzutreffen: biologische Lebensmittel, wenig explizite Wissensvermittlung, vollständiger Verzicht auf elektronische Medien, Singen, Jahreszeitentisch sowie naturnahe Gestaltungen (vgl. Krohmer, 2015; Patzlaff et al., 2010).

Methodik

Der methodische Aufbau der hier beschriebenen Studie kann grob in drei Abschnitte eingeteilt werden: Erstens explorativ-felderschließende Vorarbeiten, zweitens Konstruktion und Durchführung der Fragebogenerhebung, drittens die Datenanalyse mithilfe der Statistiksoftware SPSS.

1. In einem ersten Schritt wurden in einem deutschen Waldorfkindergarten drei Interviews geführt: Ein Interview mit einer Krippenfachkraft, eines mit einer Kindergartenfachkraft sowie ein Interview mit einer Mutter. Als Erhebungsmethode wurde die von Gläser & Laudel (2010) sowie von Meuser & Nagel (1991) vorgeschlagene Methode des Experteninterviews gewählt, die als leitfadenorientierte Methode besonders auf implizites Handlungswissen abzielt. Als Auswertungsmethode diente die induktive Kategorienbildung nach Mayring (2015). Außerdem wurde eine praxisnahe Facharbeit aus einer Erzieher-Fachschule mit herangezogen. Aus diesen qualitativen explorativ-felderschließenden Vorarbeiten konnten Arbeitshypothesen gebildet werden, die dann in der quantitativen Erhebung auf ihre allgemeinere Gültigkeit getestet wurden.
2. ‚Die Konstruktion des Fragebogens mit der anschließenden Erhebungsphase bildete den zweiten methodischen Abschnitt. Hier wurden zum einen die aus der Theorie abgeleiteten und zum anderen in besonderem Maße die in den drei Interviews sowie in der Facharbeit gefundenen Kategorien möglichen Gelingens in einzelne Items eines Fragebogens übersetzt. Der so erstellte Fragebogen gliederte sich dadurch zunächst in einen längeren ersten Abschnitt mit jeweils mehreren Items zu den Ebenen der Rahmenbedingungen, der pädagogischen Gegebenheiten, der inneren Haltungen sowie zu Vorstellungen und Erfahrungen gelingender Übergänge. Daran schloss sich ein offenes Eingabefeld an, in das darüber hinausgehende wichtige Bedingungen eines gelingenden Übergangs eingetragen werden konnten. Den Abschluss des Fragebogens bildeten zwei Fragen zum Übergang Waldorfkrippe/Waldorfkindergarten: „Wie häufig gelingt der Übergang?“ und „Wie hoch ist die Qualität des Übergangs?“. Ziel dieser Untersuchungsanlage war eine Gegenüberstellung der zu testenden Arbeitshypothesen mit den beiden letzten Fragen nach dem Qualitätserleben der beteiligten Fachkräfte. Es handelt sich daher um eine Korrelationsstudie. Der Fragebogen wurde den Waldorfkindergärten deutschlandweit zur Verfügung gestellt und konnte sowohl online als auch in Papier-Form ausgefüllt werden.
3. Der dritte methodische Abschnitt war die Datenauswertung mithilfe der Statistik-Software SPSS Statistics Version 25. Es war ein Rücklauf von 202 gültigen Fällen zu verzeichnen, was hoch genug war, um statistisch hoch signifikante Ergebnisse zu ermitteln. Zu den verwendeten univariaten Auswertungsmethoden zählten die Häufigkeitsverteilung und die Mittelwertberechnung der einzelnen Items. Zu den bivariaten Methoden zählten die Berechnung des linearen Korrelationskoeffizienten nach Pearson, der T-Test nach Student, sowie die Berechnung einfaktorieller Varianzanalysen (vgl.

Raithel, 2008, S. 119-186). Als einzige multivariate Analysemethode wurde darüber hinaus noch eine explorative Faktorenanalyse (Backhaus et al., 2016, S. 385-452) für eine Antwort durchgeführt, die auf das Ermitteln unentdeckter latenter Einflüsse auf das Qualitätserleben abzielte.

Befunde

In diesem Abschnitt werden die wichtigsten Befunde der Datenerhebung zusammengefasst. Dabei werden zuerst einzelne Ergebnisse der univariaten Statistik vorgestellt, im Anschluss Befunde der bivariaten Statistik dargestellt und zuletzt das Ergebnis der Faktorenanalyse genannt.

Univariate Statistik:

- Gemeinsame Konferenzen von Krippe und Kindergarten bei etwa 93% der Befragten
- Etwa 80% meinen, Kindergarten sei für neue Dreijährige oft noch zu anstrengend
- Etwa 60% halten ihre Einrichtung in Bezug auf Inklusion und "besondere Kinder" bei den Unter-Dreijährigen für nicht gut aufgestellt
- Etwa 17% sind der Auffassung, dass Kontinuität in den Abläufen und Gewohnheiten nicht das Wichtigste beim Übergang ist, sondern dass es in der Hauptsache darum geht, dass das Kind mit der Veränderung umgehen kann
- Die Häufigkeit des Gelingens wird höher eingeschätzt als die Höhe der Qualität
- Im offenen Eingabefeld wurden sehr viele Angaben zu vermuteten Gelingensbedingungen gemacht. Die ganz überwiegende Mehrheit der hier getroffenen Aussagen fokussierte die Themen „Kommunikation mit den Eltern", „Vertrauen und Loslassen", „Bindung/Beziehung/Eingewöhnung", „kollegiale Kommunikation" sowie „Individuelles Eingehen auf die Kinder".

Bivariate Statistik:

- Es treten Korrelationen auf zwischen Items, die nach Kommunikation fragen, mit Items, die das Belastungserlebnis erheben
- Die teilnehmenden Krippenfachkräfte schätzen Kinder, Eltern und Fachkräfte etwas belasteter ein als die teilnehmenden Kindergartenfachkräfte
- Lediglich zwei „äußere" Faktoren zeigen bei der Berechnung der einfaktoriellen Varianzanalysen einen signifikanten Zusammenhang mit dem Qualitätserleben der Fachkräfte. Diese lauten:
  - ⟹ Schriftliches Übergangskonzept
  - ⟹ Spezieller Übergangselternabend
- Es konnten aber 11 soziale bzw. „innere" Faktoren ermittelt werden, die einen deutlichen Zusammenhang mit der erlebten Höhe der Qualität zeigen
- Ein positiver Zusammenhang besteht mit:
  - ⟹ Austausch über das wechselnde Kind
  - ⟹ Austausch über die familiäre Situation des wechselnden Kindes
  - ⟹ Interesse der Krippenfachkräfte an den Abläufen im Kindergarten
  - ⟹ Interesse der Kindergartenfachkräfte an den Abläufen in der Krippe
  - ⟹ Viele gegenseitige Hospitationen

- Ein negativer Zusammenhang besteht mit:
  - ⟹ Leiden an einem zu geringen kollegialen Austausch
  - ⟹ Annahme, dass der Übergang für die Kinder belastend sei
  - ⟹ Annahme, dass der Übergang für die Eltern belastend sei
  - ⟹ Annahme, dass der Übergang für die Fachkräfte belastend sei
  - ⟹ Das Thema „Übergänge" wird als Belastung erlebt
  - ⟹ Die Begleitung der Eltern beim Übergang wird als anstrengend empfunden.

Faktorenanalyse

- Übereinstimmend mit den übrigen Ergebnissen ermittelte die explorative Faktorenanalyse für die Antwort „Die Qualität der Übergänge halte ich bei uns für… *hoch*" drei statistisch signifikante Themenbereiche:
  - ⟹ Das Miteinander der Erwachsenen (positiver Zusammenhang)
  - ⟹ Das Erlebnis von Belastung (negativer Zusammenhang)
  - ⟹ Individuelles Eingehen (positiver Zusammenhang).

Diskussion der Ergebnisse

Die sehr häufige Angabe einer gemeinsamen Konferenz von Krippen- und Kindergartenfachkräften ist als ein positives Ergebnis für eine ganz überwiegend vorhandene Struktur für professionellen Austausch zu werten. Dass allerdings etwa 80% der Teilnehmenden angaben, sie hielten Kindergarten für neue Dreijährige für oft noch zu anstrengend, weist auf notwendige Überarbeitungen im Themenbereich Eingewöhnung/Übergang in Waldorfkindergartengruppen hin. Ebenso verhält es sich mit dem Befund, dass etwa 60% angaben, ihre Einrichtung sei in Bezug auf Inklusion bei unter-dreijährigen Kindern nicht gut aufgestellt. Auch hier deutet sich Handlungsbedarf an.

Ganz besonders auffallend ist jedoch die ausgesprochen geringe Zustimmung von nur etwa 17% zu der Aussage, dass Kontinuität in den Abläufen und Gewohnheiten nicht das wichtigste ist, sondern es in der Hauptsache darum gehe, dass das Kind mit der Veränderung beim Übergang umgehen kann. Dieses Antwortverhalten steht in einem krassen Widerspruch zu den Erkenntnissen der Transitionsforschung, dass es bei der Bewältigung normativer Übergänge nicht darauf ankommt, die Übergänge *sanft* oder *fließend* zu gestalten, sondern die Ressourcen zu stärken mit Diskontinuitäten umgehen zu können (vgl. Griebel & Niesel, 2017). Es ist hierbei zu vermuten, dass die Fokussierung auf eine atmende, rhythmische Gestaltung des pädagogischen Settings in der vorschulischen Waldorfpädagogik weit verbreitet zu einer einseitigen Blickrichtung an dieser Stelle führt.

Dass die Häufigkeit des Gelingens des Übergangs höher eingeschätzt wird als die Höhe der Übergangsqualität, deutet pädagogischen Idealismus an, da das Verbesserungspotenzial des eigenen pädagogischen Handelns offensichtlich mitgedacht wird, und ein reines *Funktionieren* der Transition, so ist zu vermuten, als nicht ausreichend erlebt wird.

Die Angaben im offenen Eingabefeld des Fragebogens, die wie beschrieben vor allem die Themen „Kommunikation mit den Eltern", „Vertrauen und Loslassen", „Bindung/Beziehung/Eingewöhnung", „Kollegiale Kommunikation" sowie „Individuelles Eingehen auf die Kinder" behandeln, zeigen ganz klar, was den befragten Fachkräften besonders am Herzen liegt: Es sind die unsichtbaren kommunikativen Zwischenräume, zarte zwischenmenschliche Bedingungen eines liebevollen Miteinanders sowie Rücksicht und Respekt vor dem kleinen Kind und seinen Bedürfnissen. Dass kaum äußere Faktoren hier genannt

werden, zeigt, wie sehr die beteiligten WaldorfpädagogInnen das Individuelle und das Soziale in den Mittelpunkt ihres Handelns stellen.

Die auch bei der Berechnung der einfaktoriellen Varianzanalysen zutage getretene geringe Bedeutung äußerer Faktoren bei der Übergangsgestaltung von der Waldorfkrippe in den Waldorfkindergarten und die hohe Relevanz weicher, sozialer Faktoren zeigt ebenso an, dass es den beteiligten Fachkräften in erster Linie um einen warmen sozialen Raum und um gelungene Beziehungen zwischen Kindern, Eltern und Fachkräften geht. Äußere Gestaltungen, wie gemeinsame Gebäude, ein gemeinsames Außengelände usw. scheinen vor diesem Hintergrund eher der Ausdruck oder die Folge des sozialen Gefüges zu sein, das sich um einen gelingenden Übergang der Kinder bemüht. Es kann damit gezeigt werden, dass äußere Merkmale nicht die hauptsächlichen Faktoren einer gelingenden Übergangspädagogik von der Waldorfkrippe in den Waldorfkindergarten genannt werden können.

Dass sich bei der Faktorenanalyse zusätzlich noch das Belastungserlebnis von Fachkräften so deutlich als hemmender Faktor für gelingende Übergänge herausgestellt hat, ist zunächst nicht erstaunlich. Es unterstreicht aber die dringende Notwendigkeit, Überforderungssituationen der Fachkräfte durch gute Rahmenbedingungen beim Personalschlüssel, bei den Arbeitszeiten, durch Fortbildungen sowie soziale und finanzielle Anerkennung abzubauen. Bedenkt man an dieser Stelle die ermittelte Korrelation zwischen Kommunikation und Belastungserleben, so erweist sich die aufgrund guter Kommunikation zwischen den beteiligten Erwachsenen nicht belastete Fachkraft als herausragender Qualitätsfaktor für eine gelingende Transition des Kindes von der Waldorfkrippe in den Waldorfkindergarten.

Es zeigt sich in den Ergebnissen somit in Übereinstimmung mit bisherigen Ergebnissen der Transitionsforschung, dass es sich bei einer erfolgreichen Transitionsbewältigung immer auch um eine Kompetenz des involvierten sozialen Systems handelt (vgl. Griebel & Niesel, 2017, S. 108). Die Angaben der teilnehmenden Fachkräfte im offenen Eingabefeld zeigten dabei insgesamt allerdings einen verbreitet liebevollen pädagogischen Gestus gegenüber dem einzelnen Kind, der weit über die geläufigen Schlüsselbegriffe *Kommunikation, Ko-Konstruktion* oder *soziales System* hinausweist und größten Respekt verdient.

Handlungsempfehlungen für die waldorfpädagogische Praxis

Aus den Ergebnissen lassen sich direkte Handlungsempfehlungen für die waldorfpädagogische Praxis bzw. für die entsprechenden Ausbildungs- und Studiengänge ableiten. Diese lauten:

1. Es ist auf die Bedeutung des kollegialen Austauschs und der vertrauensvollen Zusammenarbeit mit Eltern zu achten. Es ist insbesondere darauf zu achten, dass trotz aller gebotenen professionellen Sachlichkeit ein warmes Miteinander angestrebt wird, in dem sich die Erwachsenen und die Kinder geborgen fühlen. Hierzu könnten beispielsweise sowohl gemeinsame inhaltliche Veranstaltungen wie Vorträge oder Elternabende gehören als auch gemeinsame Aktivitäten wie Gartentage mit den Fachkräften und den Familien als auch Erlebnisse außerhalb des Kindergartens wie z.B. ein gemeinsamer Ausflug oder dergleichen.
2. Es ist das Gefühl der Belastung bei Fachkräften abzubauen. Hierzu gehören sicher einerseits soziale und finanzielle Anerkennung für die geleistete Arbeit sowie eine theoretisch gut fundierte Ausbildung, die die Reflexionsmöglichkeiten des eigenen Handelns erhöht. Auf der anderen Seite ist an dieser Stelle eindeutig festzuhalten, dass die Zeiten für kollegialen Austausch, für Kommunikation über das wechselnde Kind, für notwendige Nachbesprechungen vollzogener Übergänge, für Elterngespräche, Elternabende usw. von den Einrichtungen großzügig vorgehalten werden müssen. Wer das Gefühl hat, notwendige Gespräche aus Idealismus in der Freizeit zu führen, läuft sicherlich Gefahr, sich belastet zu fühlen – oder die Gespräche nicht stattfinden zu lassen. Es ist daher darauf zu achten, dass die notwendigen Formen des Austauschs bereits strukturell in den Konferenzzeiten, durch Vertretungsregelungen bei gegenseitigen Besuchen und Hospitationen, bei der Arbeitszeit, in der Möglichkeit zu gemeinsamen Fortbildungen usw. vorgesehen sind.

3. Es ist die Möglichkeit zu einer individuellen Wahrnehmung des einzelnen Kindes zu verstärken, wo immer möglich. Übungen zur Kinderbetrachtung oder künstlerische Aktivitäten zur Wahrnehmungsschulung sind hier anzustreben. Hierzu gehört auch der gesamte Komplex der Persönlichkeitsbildung, da eine differenzierte Betrachtung verschiedener Kinder mit unterschiedlichen Bedürfnissen nur mit einem geklärten Verhältnis des Erwachsenen zu sich selbst möglich sein dürfte.

Neben diesen eher globalen Themen, können noch folgende praktische Empfehlungen abgeleitet werden:

4. Die Fachkräfte sollten sich darin versuchen, ein schriftliches Übergangskonzept zu entwickeln, das einerseits die notwendigen Formen des Austauschs und der Besuche sowie einen Übergangselternabend regelt und andererseits die Offenheit gegenüber der individuellen Entwicklung des einzelnen Kindes zum Gegenstand hat. Neben der inhaltlichen Fokussierung auf das Thema könnten durch eine solche Arbeit gleichzeitig ein gestärktes kollegiales Miteinander sowie ein größeres gegenseitiges Interesse entstehen.
5. Sowohl bereits tätige Kindergartenfachkräfte als auch Auszubildende und Studierende sollten sich in gesteigertem Maße mit bindungstheoretischen Erkenntnissen und Darstellungen zur Pikler-Pädagogik auseinandersetzen. Es sind vor diesem Hintergrund dann Übergangs- bzw. Eingewöhnungsmodelle für Waldorfkindergartengruppen zu entwickeln, die das Erlebnis der Fachkräfte abbauen, dass Kindergarten für neue Dreijährige häufig zu anstrengend ist.
6. Es sollte in jeder Einrichtung geklärt sein, wie und mit welchen Hilfen und welchen pädagogischen Folgen Kinder mit besonderem Unterstützungsbedarf im Sinne der Inklusion in der Waldorfkrippe aufgenommen werden und was das für die spätere Kindergartenbetreuung bedeutet. So können Übergangsprobleme, die in diesem Themenbereich wurzeln, besser abgefedert werden.
7. Die in der Waldorfpädagogik im Elementarbereich im Hinblick auf alle denkbaren Übergänge vermutlich vorherrschende Idee des fließenden Übergangs sollte vor dem Hintergrund der Ergebnisse der Transitionsforschung zur Bewältigung von Diskontinuitäten kritisch geprüft werden. Sowohl in der Ausbildung als auch in der Praxis sollten diese Standpunkte gewissenhaft diskutiert werden. Letztlich gilt es damit auch, zwei Perspektiven – ein Übergang sei ein Risiko, und ein Übergang sei eine Entwicklungschance – würdigen zu können.
8. Die betreffenden Fachkräfte sollten sich offen damit auseinandersetzen, dass die Gruppenerfahrung eines Kleinstkindes in einer Krippe mit den damit verbundenen anderen sozialen Kontakten zu Gleichaltrigen zu erweiterten sozialen Fähigkeiten, zu neuen Möglichkeiten der Interaktion und unter Umständen auch zu Problemen führt. Es ist vor diesem Hintergrund nicht eindringlich genug darauf hinzuweisen, dass diese Veränderung, die durch die Sozialisationserfahrung in der Krippe entsteht, nicht für die Pädagogik im Kindergarten wieder zurückgedrängt werden kann und sollte. Es sind konstruktive pädagogische Antworten, d.h. veränderte pädagogische Settings für die Kinder vorzuhalten, die nicht von anderen Kindern träumen, sondern den Fähigkeiten und Problemen der anwesenden Kinder gerecht werden. Dies zu diskutieren wäre lohnenswert für Praxis und Ausbildung.

Fazit

Es konnten mit der Arbeit eindeutige Zusammenhänge zwischen bestimmten Faktoren und dem Qualitätserleben der beteiligten Fachkräfte in Bezug auf den Übergang von der Waldorfkrippe in den Waldorfkindergarten aufgedeckt werden und dadurch auch praxisrelevante Handlungsempfehlungen abgeleitet werden. Die Studie kann durch den erstellten Fragebogen, der aufgrund des Antwortverhaltens als zuverlässiges Messinstrument eingeschätzt werden kann, als reliabel gelten. Aufgrund des nicht unüberschaubar großen Feldes von wenigen hundert Waldorfkindergärten mit Krippen- und Kindergartengruppen, auf die das Forschungsdesign zutraf, sowie der breiten Streuung der Teilnehmenden über ganz Deutschland hinweg ohne erkennbare Unterschiede bei den Antworten nach Bundesland, Einrichtungsgröße etc. kann die Untersuchung trotz der Tatsache, dass es sich methodologisch um eine Zufallsstichprobe handelt, auch als eingeschränkt repräsentativ gelten.

Als besonders interessant kann die Tatsache gelten, dass mit der Arbeit gerade eine *quantitative* Untersuchung mit einem im Vergleich zu einem *qualitativen* Ansatz sicher kleineren erfassbaren Wirklichkeitsausschnitt letztlich Zusammenhänge aufdeckt, die das Zarte, das Soziale und den unsichtbaren kommunikativen Zwischenraum betreffen. Unter Umständen kommen hier der Untersuchung die qualitativen Vorarbeiten zugute, die den durch die abgegrenzten Items eines Fragebogens natürlicherweise eng gehaltenen Erkenntnisgewinn einer quantitativen Untersuchung stark gedehnt haben könnten. Es haben sich jedenfalls, so ist abschließend zu konstatieren, unter diesen Voraussetzungen die quantitative Erhebungsmethode sowie die statistischen Auswertungsmethoden ohne Einschränkung als passend und ergiebig erwiesen.

Die mit den angewendeten statistischen Methoden identifizierten Faktoren des Gelingens könnten dabei vermutlich über die Frage nach dem Übergang von der Waldorfkrippe in den Waldorfkindergarten hinausweisen. Das Miteinander bzw. die Zusammenarbeit von Eltern und Pädagogen, ein geringes Belastungserleben seitens der Fachkräfte, die Korrelation zwischen diesen beiden Faktoren sowie das individuelle Eingehen auf einzelne Kinder sind letztlich Tugenden, auf die es sicher nicht nur beim in Rede stehenden Übergang ankommt, sondern im gesamten frühpädagogischen Bereich. Dass sich diese Faktoren bei den teilnehmenden Fachkräften so deutlich herauskristallisiert haben, ist zunächst erfreulich. Im Sinne einer zukünftigen Forschungsperspektive wäre es interessant zu prüfen, ob diese Faktoren nicht auch für andere Altersgruppen von Kindern und auch außerhalb der Waldorfpädagogik eine, wenn auch vielleicht anders gefärbte, Relevanz besitzen.

Ein noch genaueres Verständnis, was ein warmes Miteinander inhaltlich bedeuten kann, wann genau gute Zusammenarbeit mit Eltern erlebt wird oder was ein individuelles Eingehen auf ein Kind alles beinhaltet, ist mit der vorliegenden quantitativen Untersuchung kaum ausgesagt. Für ein solches Tiefenverständnis, das der qualitativen Ausprägung der gefundenen Merkmale bei einzelnen PädagogInnen nachgeht, wäre ein qualitativer methodischer Ansatz vonnöten, der die quantitativ gewonnenen Ergebnisse aufgreift und vertieft.

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Ambiguitätstoleranz in der Waldorfpädagogik

Johannes Kiersch

Mit beachtlicher Sachkenntnis hat der Mainzer Erziehungswissenschaftler Heiner Ullrich die Pädagogik der Waldorfschulen und auch den Werdegang ihres Begründers beschrieben, wohlwollend und fair, aber in einem entscheidenden Punkt bis zuletzt kritisch zweifelnd (Ullrich, 2011 und 2015). Steiner genüge mit seiner Lehre nicht den Maßstäben moderner Wissenschaft. Wie Goethe, sein großes Vorbild, falle er in die wirklichkeitsferne Bilderwelt mythischen Denkens und unzulänglicher lebensweltlicher Wahrnehmungen zurück. Wie schon in seiner Dissertation von 1986 beruft sich Ullrich dabei auf den Philosophen und Wissenschaftshistoriker Gaston Bachelard, den er auch in seiner neuesten Publikation wieder zitiert. Der „wissenschaftliche Geist", so Bachelard, sei „zu jener geistigen Askese bereit, die die eigenen Intuitionen bzw. Lieblingsbilder durch eine ‚coupure épistémologique' abstreift, das heißt zugunsten abstrakter Modelle und quantitativer Verfahren radikal mit dem Alltagswissen bricht" (Ullrich, 2015, S. 135). Es soll hier nicht erörtert werden, wie der damit als maßgeblich erklärte Begriff von Wissenschaft mit gänzlich anderen Auffassungen konkurriert (Kiersch, 2011 a), und auch nicht, ob Ullrich mit seinem wiederholten Zitat die weiträumige Philosophie Bachelards zu sehr vereinfacht wiedergibt. In der vorliegenden Betrachtung geht es darum, die besondere pädagogische Bedeutung der von Ullrich so entschieden als unzulänglich verworfenen Art des Wissens aus aktueller Perspektive zu beleuchten. Hierzu mag zunächst ein aphoristischer Gedankengang dienen, der dem am Forschungsparadigma der landläufigen Physik orientierten Wissenschaftsbegriff Heiner Ullrichs gänzlich fernsteht.

Der amerikanische Lyriker Ezra Pound interessierte sich im Jahre 1934 für die eigentümliche Wirklichkeitsnähe der alten chinesischen Schriftzeichen, die noch nicht die Abstraktionsebene der auf isolierte Phoneme bezogenen Buchstabenschrift erreicht haben. Was er in einem berühmten poetologischen Essay darüber schreibt, mutet an wie ein Kontrastprogramm zu dem zitierten Wirklichkeitsbegriff Bachelards:

> „In Europe, if you ask a man to define anything, his definition always moves away from the simple things that he knows perfectly well, it recedes into an unknown region, that is a region of remoter und progresssively remoter abstraction.
>
> Thus if you ask him what red is, he says it is a ‚colour'.
>
> If you ask him what a colour is, he tells you it is a vibration or a refraction of light, or a division of the spectrum.
>
> And if you ask him what vibration is, he tells you it is a mode of energy, or something of that sort" (Pound, 1961, S. 19).

Ganz anders verfahre der Chinese.

> „He is to define red. How can he do it in a picture that isn't painted in red paint?
>
> He puts (or his ancestor put) together the abbreviated pictures of
>
> ROSE CHERRY
>
> IRON RUST FLAMINGO
>
> [...]The Chinese ‚word' or ideogram for red is based on something everyone KNOWS" (Ebd., S. 22).

Aber auch im Bereich der Naturwissenschaften findet sich ein vergleichbarer Gedankengang, womöglich nicht zufällig zur gleichen Zeit konzipiert wie der Text von Ezra Pound. Der polnische Mediziner Ludwik Fleck veröffentlichte im Jahre 1935 sein grundlegendes Werk über die „Entstehung und Entwicklung einer wissenschaftlichen Tatsache" (Fleck, 1980). Als kompetenter Serologe wählte er als Beispiel für einen Tatbestand, aus dem im Prozess wissenschaftlicher Bearbeitung ein abstrakter Begriff und schließlich eine handfeste „Tatsache" hervorgeht, den bakteriologischen Untersuchungsbefund, der sich für den geschulten Experten beim Blick durch sein Mikroskop ergibt. Er zeigte, wie dabei die verwirrende Fülle der Eindrücke, die den Laien völlig überfordern würde, durch erprobte Strategien zu einer handhabbaren Begriffsbildung geordnet und konsolidiert wird, wie zugleich vieles, was sich beschreiben ließe, vernachlässigt wird und welche Rolle dabei der gewöhnlich nicht reflektierte besondere Denkstil des Beobachters spielt. Dabei gliedert sich nach Fleck der Konsolidierungsprozess, ausgehend von der noch völlig undefinierten direkten Wahrnehmung, in die offene, noch bewegliche, unterschiedliche Deutungsmöglichkeiten erwägende „Zeitschriftenwissenschaft", die daraus gewonnene konzentriertere „Handbuchwissenschaft" und schließlich die „populäre Wissenschaft in ihrer denksozialen und erkenntnistheoretischen Bedeutung" (Fleck, 1980, S. 146ff.), als deren stabilste Version – wie wir hinzufügen dürfen – das noch weiter vereinfachte Wissen unserer Schulbücher gelten kann.

Die von Ezra Pound ebenso wie von Ludwik Fleck angeregte wissenschaftstheoretische Aufmerksamkeit auf das unmittelbare sinnliche Wahrnehmen, bei dem jedes theoriegeleitete Suchen nach einer zuverlässig ermittelten Wirklichkeit anzusetzen hat, wird neuerdings in ein bemerkenswertes pädagogisches Licht gerückt durch die These des Islamwissenschaftlers Thomas Bauer, dass gegenwärtig auf allen Gebieten des Lebens ein „Verlust an Mehrdeutigkeit und Vielfalt" zu beklagen sei (Bauer, 2018). Bauer hatte in einer umfangreichen historischen Studie darauf aufmerksam gemacht, dass seit dem 8. Jahrhundert, in der Blütezeit des Islam, das reiche kulturelle Leben und der Wohlstand der nahöstlichen Kalifen-Reiche und ihrer Ableger in Nordafrika und Andalusien mit einem religiös begründeten, tiefen Respekt vor der Vieldeutigkeit der Welterscheinungen verbunden war, mit der Fähigkeit, das begrifflich nicht eindeutig Fassbare in seiner ganzen Vorläufigkeit ernst zu nehmen und auszuhalten, einer umfassenden *Ambiguitätstoleranz*. Daraus ergab sich zugleich eine bemerkenswerte Duldsamkeit gegenüber den religiösen Traditionen unterworfener Völker. Erst die verhängnisvolle Vorstellung von einer absolut gültigen Wahrheit, die sich im christlichen Mittelalter durchsetzte, drängte auch die islamische Welt in die menschenfeindliche Dogmatik fundamentalistischer Strömungen, die uns jetzt zu schaffen machen (Bauer, 2011). Im Lichte dieser Einsicht kritisiert Thomas Bauer nicht nur den gegenwärtigen massiven Artenschwund bei Pflanzen und Tieren, die von Profitinteressen gesteuerte Einschränkung der Sorten-und Artenvielfalt in der Landwirtschaft, sondern auch die Vereinheitlichung menschlicher Verhaltensweisen, den damit einhergehenden Leistungs- und Messbarkeitswahn, die Verödung der Lernkulturen (Bauer, 2018).

Nun werden die von Thomas Bauer charakterisierten Entwicklungen von Seiten der Waldorfpädagogik seit langem mit ähnlicher Sorge beobachtet. Der immer wieder an Goethe anschließende naturwissenschaftliche Unterricht der Waldorfschule pflegt das unmittelbare Wahrnehmen der Phänomene und sucht nach Wegen, das notwendige Heranführen an Bachelards „quantitative Verfahren" und „abstrakte Modelle" altersgemäß zu modifizieren, so dass die Phänomene dabei nicht vernachlässigt, sondern in ihrer ursprünglichen Vielfalt sinnlich erfahren, handelnd erprobt und zueinander in Beziehung gesetzt werden, ohne durch abstrakte Begriffsbildungen vorschnell vereinfacht und unsachgemäß fixiert zu werden. Das Gleiche gilt für das Feld der musischen und der bildenden Künste und der Kulturwissenschaften.Wie keine andere pädagogische Richtung pflegt damit auch die Pädagogik Rudolf Steiners eine umfassende Ambiguitätstoleranz.

Wie die neuere Forschung herausgearbeitet hat, wird – entgegen einem verbreiteten Vorurteil – auch Rudolf Steiners Anthroposophie von ihrer philosophischen Grundlegung im erkenntnistheoretischen Frühwerk ihres Begründers bis zu dessen späterer Esoterik von einer umfassenden Ambiguitätstoleranz im Sinne Thomas Bauers getragen (Bockemühl & Kugler,1993, Sam, 2000 und 2004, Demisch u. a., 2014, Kaiser, 2019). Wo die Waldorfpädagogik dogmatisch auftritt, handelt es sich – anthroposophisch gesehen – um eine Regresson in die Vorstellungswelt des Zeitalters der „Verstandes- und Gemütsseele", die in den theologischen Summen der Hochscholastik zu ihrer deutlichsten Ausprägung kam und in degenerierter

Form im „Denkstil“ der positivistisch-materialistischen Naturwissenschaft der Gegenwart nachwirkt (Kiersch, 2016 a, S. 65ff.). Steiner hat schon zu Beginn seines Wirkens in der Theosophischen Gesellschaft die Notwendigkeit einer konturierten Lehre mit dem Verzicht auf jeden absoluten Wahrheitsanspruch in Einklang gebracht (Kaiser, 2011 und 2019). Nach dem Brand des Goetheanum-Baus in Dornach, im Jahre 1923, äußerte er sich besorgt über sektenhafte Tendenzen unter seinen Schülern. Nur eine „Versuchsmethode des allgemein Menschlichen“ strebe er an, ohne jeden Anspruch auf Autorität (Steiner GA 259, S. 174. Kiersch, 2016 b). Schon im Jahre 1909, während er seine große Kosmologie, die „Geheimwissenschaft im Umriss“, für den Druck vorbereitet, weist er seine anthroposophisch orientierten Hörer darauf hin, dass sie dazu herausgefordert seien, sich als individuelle Verantwortungsträger für den Fortgang der Weltevolution zu betätigen. Auch Tiere könnten Tatsachen wahrnehmen, aber nur der Mensch sei in der Lage, Beziehungen zwischen Tatsachen herzustellen. Damit produziere er „Schöpfungen aus dem Nichts“, individuelle Synthesen von sinnlicher Wahrnehmung und persönlicher Intuition, die er dem natürlichen Verlauf der Entwicklung produktiv einfüge (Steiner, 2011).

Was Steiner damals in abstrakter Allgemeinheit ausführte, wurde nach der Schulgründung von 1919 zum Leitmotiv für die Unterrichtspraxis. In den Stuttgarter Lehrerkursen und in zahlreichen Vorträgen (Kiersch 2004, S. 709ff.) betont Steiner immer wieder, wie sehr es darauf ankomme, Kinder und junge Menschen die Rätsel der Welt fühlen zu lassen, sie das Staunen zu lehren, das Spiel der Phantasie anzuregen, Ahnungen und Fragen zu wecken. Den Lehrern rät er, „sinnige Geschichten“ zu erfinden, die von rätselhaften Naturerscheinungen ausgehen (Fucke, 1981), den jungen Kindern Märchen nahe zu bringen, die älteren durch freie Erzählungen im „Hauptunterricht“ an die Bilderwelt alter Mythen heranzuführen. Die Schilderungen des Alten Testaments, der nordischen Edda und der Epen Homers, inzwischen klassisch gewordener Erzählstoff für die Mittlere Kindheit (Müller-Wiedemann, 2017), fordern dazu heraus, Vielfalt unbefangen gelten zu lassen. Die Kinder üben daran den Perspektivenwechsel, den das Leben heute, mehr denn je, von ihnen verlangt. Der Gang durch die unterschiedlichen Mythenwelten erweist sich, so gesehen, als wissenschaftliche Propädeutik für die Bewältigung aktueller Probleme in allen Berufsfeldern.

Die Förderung von Ambiguitätstoleranz im naturwissenschaftlichen Unterricht der Waldorfschule ist inzwischen in einer ganzen Reihe von geradezu klassischen Beispielen ausgearbeitet worden: dem phänomenologischen Studium des Verbrennens unterschiedlicher Materialien lange vor der Einführung des Begriffs der Oxydation, in der ersten Chemiestunde nach Eugen Kolisko (Buck & Mackensen, 2006); dem Beobachten der Erscheinungen am Sternenhimmel vor der Diskussion des kopernikanischen Erklärungsmodells (Kraul, 2014); dem Gespräch über das Wasser und die Fülle seiner Ausdrucksformen vor der Einführung des periodischen Systems der Elemente und des Begriffsapparats der Molekularchemie (Buck & Kranich, 1995); dem Entdecken von Beziehungen zwischen der seelischen Entwicklung des jungen Menschen und der Stufenfolge der Pflanzenformen vom Pilz bis zu den Blütenpflanzen (Gögelein, 1990). Ambiguitätstoleranz ist auch ein Kernziel des Sprachunterrichts der Waldorfschule, der zum kreativen Umgang mit gesprochener Sprache anregt, zur Freude an ungewöhnlichen Wörtern und Wendungen, zu stilistischen Betrachtungen, und jede verfrühte Festlegung auf eindeutige Begriffe vermeidet, ganz im Sinne der Einwände, die etwa Susan Sontag oder Hans Magnus Enzensberger gegen die Banalität verbreiteter Interpretationstechniken vorgebracht haben (Sontag, 1961, Enzensberger, 1988). Dazu gehört auch das behutsame gemeinsame Erforschen inkommensurabler Phänomene im Grammatikunterricht (Dühnfort, 1997). Schulanfänger werden am wöchentlichen „Maltag“ des Hauptunterrichts durch Übungen im Aquarellmalen an das unbefangene Erleben von Farbqualitäten herangeführt (Wildgruber, 2013).Ein schönes Beispiel aus dem Kunstunterricht der Oberstufe sind Steiners Vorschläge für den Umgang mit einem Kupferstich Albrecht Dürers, der Schülern der 9. oder der 10 Klasse eigene bildnerische Gestaltungsversuche abfordert und zugleich ein beschauliches Nachsinnen über die geistesgeschichtlichen Hintergründe des großen Werkes anregt (Kiersch, 1990). Zur Tradition im Lehrplan der Waldorfschule gehört auch der besinnliche Umgang mit dem Parzival-Epos Wolframs von Eschenbach in der elften (Steinwachs, 2016) und mit Goethes Faust-Drama in der zwölften Klasse: anspruchsvollen Lerngegenständen, die altersgemäße Prozesse der Selbstvergewisserung im Medium des freien Gesprächs über große alte Bilder anregen und ausreifen lassen. Auch Dantes *Divina Commedia* oder der *Anticlaudian* des Alanus ab Insulis mag dafür in Frage kommen, große Beispiele für das Bewältigen von Lebensfragen ohne jeden Anspruch auf wissenschaftlich

abgesicherte Eindeutigkeit. Man wird bemerken, dass alle diese Lernmotive nicht nur eine kognitive Seite haben, sondern immer auch das Gefühlsleben berühren und anregen. Steiners Hinweis auf die Wichtigkeit der „Gefühlsbegleiterscheinungen" im Unterricht (Steiner, 1986, S. 13) wird durch seine Lehre von der Dreigliederung der Seelenfähigkeiten (Steiner, 1983 und 1992. Kiersch, 2011 b, S. 442-448) detailliert begründet.

Überall berührt die Bemühung um Ambiguitätstoleranz das sehr alte und zugleich sehr moderne Problem des Umgangs mit dem Unsagbaren, den Weltgeheimnissen hinter der Fassade der Wortsprache. Wolfram Eilenberger hat an vier prominenten Beispielen, den philosophischen Debatten um und zwischen Ludwig Wittgenstein, Walter Benjamin, Martin Heidegger und Ernst Cassirer, den heroischen Kampf beschrieben, der zeitgleich mit dem pädagogischen Wirken Rudolf Steiners und der Begründung der Waldorfschule um die philosophische Klärung dieses Problems stattgefunden hat (Eilenberger, 2018). Hinzuweisen ist in diesem Zusammenhang auch auf die Ergebnisse der neueren Esoterik-Forschung, welche die große Erzählung vom Kampf der neuzeitlichen Naturwissenschaft gegen finsteren Aberglauben als ein problematisches Manöver der Selbstvergewisserung relativiert und den hermetische Traditionen älterer Zeiten auf überraschende Weise neuen Respekt verschafft hat (Hanegraaff, 2012, Melzer 2014). Was mit der „ungeschriebenen Lehre" Platons (Schefer, 2001) zum ersten Mal in Erscheinung trat, wird gegenwärtig zur Aufgabe auch der Pädagogik (Kiersch, 1998). Und das Erziehen zu Ambiguitätstoleranz könnte sich als unverzichtbare Vorbereitung auf die Lösung dieser Aufgabe erweisen.

Gegenwärtig hat sich jedes Bemühen in dieser Richtung nicht nur mit wissenschaftstheoretischen Einwänden auseinanderzusetzen, sondern auch mit dem modischen Druck einer Welle von Sympathie für eine umfassende Digitalisierung des Schulunterrichts. Es ist nicht zu bezweifeln, dass Kinder und Jugendliche Kenntnisse und Fertigkeiten im Umgang mit datenverarbeitenden Geräten erwerben müssen. Die Diskussion der Frage, in welchem Alter und in welcher Form sie damit vertraut gemacht werden sollten, kann aber durch das einleitend erwähnte Argument Thomas Bauers gegen den drohenden Verlust an Mehrdeutigkeit und Vielfalt in vieler Hinsicht vertieft werden. Denn die Montage von Textbausteinen aus dem Internet oder die Arbeit mit Power Point-Präsentationen fördern massiv diesen Verlust. Zugrunde liegt die problematische Vorstellung, es komme für einen effizienten Schulunterricht darauf an, klar definiertes Wissen, von Experten kompetent ausgearbeitet, in den Lernprozess einzuführen und den angestrebten Erkenntniszuwachs zuverlässig zu evaluieren. Für „Gefühlsbegleiterscheinungen", für Besinnlichkeit, für Ahnungen und Träume, für individuelle Zugänge zur Wirklichkeit ist da kein Platz. Die Gegenstrategie einer anthroposophisch orientierten Medienpädagogik nimmt inzwischen Kontur an. Zentral ist dabei Edwin Hübners Plädoyer für eine „indirekte" Medienerziehung (Hübner, 2015).

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